THE DEVELOPMENT OF INFANT SELF-REGULATION IN THE CONTEXT OF FAMILY HISTORY OF MENTAL ILLNESS: A THREE-GENERATION STUDY

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A DISSERTATION

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Young children's capacities for emotional, biological, and behavioral self-regulation are key indicators for their optimal developmental outcomes. Early in their lives, infants display limited regulatory capacity and largely rely on their caregivers to observe, learn, and practice regulation strategies. However, caregivers who suffer from mental disorders, especially those characterized by affective and behavioral dysregulation, tend to be compromised in their abilities to provide these essential learning opportunities, often leading to compromised self-regulation skills in their offspring. The current dissertation examined the impact of family history of mental illness on the development of self-regulation during infants' first two years of life. This dissertation also explored the role that parental behaviors during parent-child interactions might play as mechanisms that explain this association. Operationalizing infants' self-regulation by behavioral orientation, the results revealed that infants demonstrated overall increasing regulatory capacities from 3- to 24-months, with, however, a short-term decrease from 3- to 12-months. Moreover, there was significant within-sample individual differences in these trajectories. Further, those who demonstrated self-regulation intercept subsequently experienced slower development of self-regulation. Analyzing the impact of parental lifetime psychopathology on such development, maternal psychopathology was

associated with self-regulation intercept, whereas fathers' internalizing disorder predicted infants' faster self-regulation growth rate. Regarding the association between parental history of psychopathology and infant self-regulation development, parental behaviors including both positive and negative behaviors demonstrated moderating effects. Finally, the three-generation analyses revealed that lifetime psychopathology in G1 maternal grandmothers showed an overarching influence on their grandchildren's self-regulation, and lifetime psychopathology in G1 paternal grandparents demonstrated moderating effects on the association between G2 fathers' psychopathology and G3 self-regulation development. This dissertation advances the current literature on the development of self-regulation during infancy and early childhood by addressing (a) its development trajectory, (b) maternal, paternal influences, as well as grandparental influences, and (c) the potential mechanisms through which family history of mental illness may impact the development of children's self-regulation. Finally, the results of this dissertation can inform the development of interventions, including early identification of those who are at risk for self-regulation development difficulties, and early intervention strategies.

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DEDICATION

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CHAPTER I. INTRODUCTION

1. The Concept of Self-Regulation

1.1. Self-Regulation

Self-regulation refers to the process that modulates one's reactivity, including either facilitating (e.g., approach, attach) or inhibiting (e.g., withdraw) one's arousal and emotional responses (Rothbart, Bates, Damon & Lerner, 2006). Over the past few decades, researchers have recognized the importance of self-regulatory capacity in children's development. As suggested by Rothbart, Ahadi, and Evans (2000), children's self-regulation is a key predictor of adaptive and maladaptive functioning. Specifically, empirical research has identified that children with a greater capacity for self-regulation early in life tend to have higher academic achievement, better interpersonal relationships, and are at lower risk for physical and mental disorders (for a review, Goodman, 2007). In their landmark report "*From Neurons to Neighborhoods"*, the National Research Council and Institute of Medicine (2000) concluded that one of the core concepts of development that has emerged from years of research is that "the growth of self-regulation is a cornerstone of early childhood development that cuts across all domains of behavior" (Bosquet Enlow, Kitts, Blood, Bizarro, Hofmeister, & Wright, 2011, p. 3).

Self-regulation is viewed as one of the two main components of child temperament (Rothbart, 1989b; Rothbart & Derryberry, 1981), with the other component being reactivity. A key difference between reactivity and self-regulation is the involuntary (or less voluntary) versus voluntary nature of control, respectively (Eisenberg, Cumberland, et al., 2001). Reactivity, or involuntary control, is usually viewed as control-related behaviors or attentional processes that generally are not effortfully modulated, and is

therefore labeled as passive or reactive control-related processes. In other words, reactivity concerns one's responses to external and internal stimuli changes, and includes a broad range of reactions (e.g., negative affect, fear, approach, motor activity and cardiac activity) and is thought to be present at birth, thus reflecting a relatively stable characteristic of the child (Rothbart, 1989a; Rothbart, 1989b; Rothbart & Derryberry, 1981). In contrast to this involuntary control process, self-regulation involves *inhibitory control* (the capacity to plan and effortfully suppress inappropriate responses under instructions or in novel or uncertain situations) and *attentional regulation control* (the abilities to maintain attentional focus upon task-related channels or to shift one's focus as needed to deal with task demands). Taken together, regulatory control reflects a child's ability to voluntarily sustain focus on a task, to voluntarily shift attention from one task to another, to voluntarily initiate action, and to voluntarily inhibit action (Rothbart & Derryberry, 1981).

Figure 1. Components of Self-Regulation

The inhibitory control component within the self-regulation process is most often conceptualized as a behavioral form of self-regulation (Figure 1). One classic example of such behavioral self-regulation is demonstrated by children's performance during the Delay of Gratification task (Mischel & Mischel, 1987). In this task, children (usually preschoolers) were presented with a plate of treats such as marshmallows. The child was

then told that the researcher had to leave the room for a few minutes, and was given a simple choice: If the child waited until the researcher returned, he/she could have one additional marshmallow. These studies have provided important insights in children's capability to voluntarily regulate their actions given their perceived goals. More importantly, researchers observed that older children are much more likely to wait until the experimenter's return. From their results, Mischel and Mischel (1987) reported an orderly developmental sequence in children's knowledge of rules as well as their usage of strategies for effective delay of gratification, suggesting that there are age-specific characteristics of self-regulation, and thus the importance of understanding the developmental course of self-regulation across early childhood.

In additional to the behavioral processes of control (i.e., inhibitory control), self-regulation also has neural processes that function to modulate young children's underlying reactivity (i.e., attentional regulation control; Rothbart & Derryberry, 1981), or the underlying mechanisms that mediate environmental input and behavioral regulation output (Figure 1). Specifically, it was suggested that self-regulation may be carried out by the *covert attentional processes* (Rothbart & Derryberry, 1981). For example, orienting toward a positive stimulus may maintain or enhance arousal and emotion, whereas orienting away from a negative stimulus may serve to contain or attenuate these states.

1.2. Developmental Trajectories of Self-Regulation

The development of self-regulation follows a non-linear pattern of growth throughout early childhood. It is also important to note that, as Rothbart (1989a) suggested, children

express their reactivity and regulation differently at each unique developmental stage. For young infants, although exhibiting very little self-regulatory capacity (Fox & Stifter, 1989; Posner & Rothbart, 1998), from the earliest days, infants demonstrate that they are not only reacting to environmental and internal stimuli, but are actively influencing and regulating their own experience. For instance, McGuire and Turkewitz (1979) have noted that approach (i.e. orienting towards) associated with the presentation of low-intensity stimuli is already present in the newborn, with looking or turning away (withdrawal) associated with the presentation of high intensities of stimulation (Rothbart, 1989b). In addition, at this infancy period, through orienting, it is expected that reactivity can be initiated (e.g., in the visual domain, by looking toward), enhanced (looking intently), maintained (extended orienting), reduced (gaze aversion), or terminated (looking away) (Posner & Rothbart, 1998; Rothbart & Derryberry, 1981; Rothbart, 1989b). In other words, infants' orienting reflex provides a physical basis for the ability to modulate attentional activities within sensory specific areas (Posner & Rothbart, 2000), which serves as an important representation of children's later regulatory capacity. Indeed, this orienting capacity assessed during infancy has been shown to closely associate with later active and voluntary regulation control (Casalin, Luyten, Vliegen, & Meurs, 2012). Corroborating from psychometric perspectives, subsequent research examined the continuity of age-appropriate temperament measures and provided evidence for the continuity between infants' early orientation capacity and later self-regulation measures (e.g., effortful control; Putnam, Rothbart, & Gartstein, 2008). As such, individual differences in orienting capacity during infancy therefore represent an early phenotype relevant to trajectories of self-regulation across the lifespan.

Late in the first year of life, infants' modulation of their reactivity improves with maturation as the infants acquire new skills to deal effectively with their responses (Fox & Stifter, 1989). They also quickly enhance their ability to anticipate stimulation, so that they may act on the basis of the results of past experience as well as in direct reaction to the current stimulus intensity. As a result, infants seek out stimuli that have been previously associated with positive consequences and avoid stimuli previously associated with negative consequences (Rothbart, 1989b). Moving towards infants' first birthday, it is hypothesized that an important form of self-regulatory control is acquired, whereby some infants who previously were approaching unfamiliar and/or intense stimuli, now inhibit their approach responses (i.e., behavioral inhibition, Rothbart, 1989b). Schaffer (1974) observed that although infants of 5 months demonstrate their ability to distinguish between novel and familiar objects, they reach equally quickly for both novel and unfamiliar objects. At 8 months, however, they show greater hesitancy in grasping the novel toy. Finally, these maturation leads to the development of young children's executive attention that emerges during the second half of first year and assists children's distress regulation.

Beyond the first year of life, infants recognize and start actively utilizing their caregivers as sources of regulation. For example, they continue to be dependent on their caregivers' ability to notice, recognize, and respond to their needs for assistance with regulatory functions (Hoffman, Crnic, & Baker, 2006). More importantly, they gradually learn to participate in co-regulatory dyadic processes that lead to the independent capacity of *self*-regulation (Beebe, 2011; Beeghly, Fuertes, Liu, Delonis & Tronick, 2011). This self-regulation capacity then undergoes considerable further development

between two and seven years of age. Particularly, in the preschool period, children's self-regulation demonstrates its most dramatic developmental increase, given the combination of rapid brain maturation and their great absorption of environmental inputs (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Postner & Rothbart, 1998). It is believed that, children actively learn from this co-regulation process and subsequently internalize the rules of conduct, or the "regulated or appropriate behavior in response to contextual demands even in the absence of surveillance" (Eiden, Schuetze, Veira, Cox, Jarrett, & Johns, 2011; p. 65). This internalization of rules of conduct serves as the basis for children's *self*-regulation. As children develop into middle childhood, self-regulation continues to grow at a moderate rate. This middle childhood to adolescence developmental stage is marked by changes in children's family and social lives, during which the will for achieving individualization increases, whereas parental inputs dramatically decrease (Lengua, 2006).

This non-linear developmental trend was confirmed by the study by Partridge and Lerner (2007), which examined the developmental trajectory of children's difficult temperament from one to five years of age. Relatedly, Caspi, Sugden, and colleagues (2003) pointed out the plasticity of self-regulation during the infancy and early toddlerhood, making this stage of development especially important for investigating environmental factors that shape the development of young children's regulatory capacity. In fact, Kiff, Lengua and Zalewski (2011) suggested that infancy and preschool years might be a "sensitive period" for children's regulatory capacity development to be impacted by factors such as parental behaviors.

1.3. Individual Differences in Self-Regulation

As reviewed above, previous research suggested a general normative developmental pattern in self-regulation. Nevertheless, there are also considerable levels of individual difference within such pattern. Rothbart and Derryberry (1981) characterized child temperament as having a *constitutional* basis, indicating that children's temperament (i.e., reactivity and self-regulation) reflects a relatively enduring biologically-based aspect of the individual, which is also influenced over time by heredity, maturation, and experience (Rothbart & Bates, 2006; Rothbart & Derryberry, 1981). Given the importance of self-regulation for a range of later functioning, identifying the predictors that either ensure or interfere healthy self-regulation development has been a critical area of research. Such determining factors include, but certainly not limited to, parental psychopathology and parental behaviors (Bosquet Enlow, et al., 2011).

These individual differences in self-regulation may also result from children's psychophysiological development. Posner and Rothbart (1998) emphasized the involvement of executive attention in children's effortful regulation, which determine some children's relative lack of emotional and behavioral control. Specifically, with respect to the executive attention network – the brain network consists of the anterior cingulate cortex (ACC) and lateral prefrontal areas that are identified to be activated when executive attention is required - although fMRI work has demonstrated that children activate the same network of areas as do adults when performing executive attention tasks, the average volumetric area of activation appears to be significantly greater in children than in adults (Rothbart & Rueda, 2005). This indicates that, across

early childhood development, the brain circuitry underlying executive regulation is becoming more focal and refined (Rothbart & Rueda, 2005).

Such refinement may be altered on a temporary or more permanent basis depending on the environmental input received (Posner & Rothbart, 2000), especially during *early years* such as infancy. Generally speaking, infancy is viewed as a period during which influences on development may be the strongest (Bornstein, 2014; Goodman, 2015). However, just as this sensitivity allows children's self-regulation to grow and respond to environmental inputs, vulnerability also arises as some environmental inputs can also harm such growth. One such critical environmental input is parental behaviors, which can be either nurturing and facilitative or harmful, depending of the health and capacities of the parents.

2. Parental Psychopathology as a Vulnerability Factor for Children's Self-Regulatory Development

2.1. Maternal Disorders of Affect and Behavioral Dysregulation

Goodman (2015) defined vulnerability as "qualities or characteristics of the infant or the environment that increases the likelihood of the later development of psychopathology" (p. 394). Potential sources of vulnerability are numerous, ranging from genetic and other biological factors, family characteristics, and multiple other environmental qualities. With regard to children's self-regulation, maternal depression is among the most well-studied vulnerability factors for problematic regulatory capacity development (for a review, see Goodman, 2015).

In the current dissertation, I have broadened the scope from maternal depression to "disorders of affective dysregulation" as a vulnerability factor for poor infant regulatory capacity development for several reasons. First, the lack of ability to regulate distressing emotions through mental processes is a shared characteristic among several common but difficult-to-treat psychiatric illnesses, including depressive disorders, anxiety disorders, trauma- and stress-related disorders and personality disorders (Taylor, Bagby & Parker, 1999). Second, developmental psychopathology researchers have suggested that it is the characteristic of caregivers' dysregulated emotions as part of their psychopathology that leads to their offspring's self-regulation difficulties, but not the disorders *per se*. For instance, having reviewed a series of cross-sectional and longitudinal studies from the late 1970s and early 1980, Beardslee, Versage, and Gladstone (1998) concluded that children from homes with parents with affective disorders, including major depressive disorder, are at a significantly greater risk for psychiatric disorders than children from homes with non-ill parents and also children with parents with other types of psychiatric disorders. Similarly, examining different presentations of maternal depression, Cohn and Tronick (1989) observed that infants respond differently to sub-types of depression, with infant behavioral dysregulation being the most evident among infants of mothers whose depression is primarily manifested by withdrawn emotions. The researchers subsequently concluded that infants are sensitive to maternal affect, and that therefore mothers' affective style may be a more critical factor than the mothers' diagnostic status on their offspring's regulatory capacity. Third, there is a high comorbidity rate among disorders of affect dysregulation (American Psychiatric Association, 2013). Furthermore, studies of longitudinal samples have demonstrated that, when parental depression is comorbid with

other disorders, risk increases for offspring's problematic psychological development (Beardslee, Gladstone, & O'Conner, 2011). In addition, this high overlap among disorders of affect dysregulation makes it challenging to investigate the contribution of each psychiatric disorder separately. In the literature, these disorders of affective dysregulation are frequently labeled as internalizing disorders (Krueger, McGue & Iacono, 2001).

Alongside the internalizing disorders, which are characterized by affective dysregulation, another group of higher-order psychologically coherent dimension of DSM disorders is externalizing disorders (Krueger et al., 2001). This group of disorders is typically characterized by externalizing and maladaptive behaviors that are expressed outwards (i.e., towards others rather than the self). In other words, externalizing disorders typically involve *behavioral* dysregulation. As reviewed above, dysregulation, as an underlying psychopathological component, may be the key that leads to offspring's self-regulation outcomes. Therefore, it is important to consider multiple aspects of dysregulation, including both affective dysregulation (i.e., internalizing disorders) and behavioral dysregulation (i.e., externalizing disorders).

In the current dissertation, I aim to examine both groups of disorders as potential vulnerability factors for children's self-regulation development in the early years. However, the existing literature on investigating parental psychopathology as a vulnerability factor for infants' self-regulation has mainly focused on one disorder (e.g., Major Depressive Disorder), or one type of disorder (e.g., internalizing disorders), at a time. Therefore, the following sections review the literature within each category of psychiatric disorders.

2.2. Parental Psychopathology and Children's Self-Regulation

2.2.1. Maternal Mood Disorders and Children's Self-Regulation

Depression is remarkably common among parents. According to an Institute of Medicine (IOM) report, at least 15 million children in the U.S. are living in households with parents who have major or severe depression (England & Sim, 2009). Moreover, the number of children exposed to parental depression is much larger when the entire span of childhood is considered, rather than a single year, and when other forms of parental mood disorders are included (Austin, Hadzi-Pavlovic, Leader, Saint, & Parker, 2005). In addition, majority of parents who recover from an episode of depression either experience a reoccurrence of another episode (Belsher & Costello, 1988) and/or continue to experience subclinical levels of depressive symptomatology (Almeida & Kessler, 1998; Lennon, 1987). Similarly, with anxiety disorders, it is reported 18.1% of adults, including parents, in the U.S. experiences an anxiety disorder (National Alliance on Mental Illness, 2017). A consequence of these statistics is that many children are repeatedly exposed to their caregivers' internalizing disorders throughout their early lives. As a result, exposure to maternal internalizing disorders can result in the offspring having difficulties with the regulation of stress-induced changes.

Behaviorally, the impact of maternal mood disorders may be observed as early as the neonatal period. Abrams, Field, Scafidi, & Prodromidis (1995) found that newborns of mothers with depression tend to display poorer orienting skills, suggesting that these newborns are having more difficulties localizing the sound of a shaking rattle or tracking a moving bell. Increased irritability has also been observed among newborns of mothers with depression (Field, Sandberg, Garcia, Vega-Lahr, Goldstein, & Guy, 1985).

Similarly, excessive crying and fussiness were observed among infants of mothers who reported anxiety during pregnancy (van der Wal, van Eijsden, & Bonsel, 2007).

As infants grow, their regulatory behaviors can be readily observed through the Still Face Paradigm, a developmental experiment that assesses infants' responses to entrapment between contradictory messages in face-to-face interaction, which includes the still-face phase (i.e., caregivers stay non-responsive) and the reunion phase (i.e., caregivers restore normative interaction with infants; Tronick, Als, Adamson, Wise, & Brazelton, 1978). Weinberg and Tronick (1998) asked a group of children of mothers with depression and/or anxiety disorders, as well as a control group of children of mothers without disorders of affective dysregulation, to perform the Still Face Paradigm with both their mothers as well as strangers. They observed these children's significant behavioral disturbance not only during the still-face stage. Importantly, when the stressor was removed (i.e., the reunion phase where mother resumed regular interaction with child), children of mothers with affective disorders continued to interact negatively with their mothers by showing less interest, more anger and sadness, and a greater tendency to fuss and cry, indicating these children's difficulties in regulating and repairing their emotional states after stress exposure. Interestingly, researchers observed that children of mothers with affective disorders expressed greater negative affect even with strangers (i.e., people who were not depressed or anxious), suggesting that these children's affective-behavioral regulatory organization has been generally disrupted as an outcome of maternal affective disorder (Weinberg & Tronick, 1998). Later in development, when behavioral inhibition emerges as a more direct indicator of children's regulatory capacity, the association between maternal internalizing disorders and children's regulation has

also been observed. Rosenbaum, Biederman, Hirshfeld-Becker, Kagan, & Snidman (2000) assessed behavioral inhibition in 284 children aged 2 to 6 years by observing each child's reactions to unfamiliar events, including people, objects, and environment. Children were drawn from three groups: children of mothers with both panic disorder and major depressive disorder, children of mothers either panic disorder or major depressive disorder, and children of mothers with neither disorder. Results revealed that children with a parent who has either or both panic disorder and major depressive disorder were five times more likely than children in the comparison group to be rated as behaviorally inhibited. Between the two experimental groups, children of mothers with both disorders are almost as twice as likely to display behavioral inhibition than children of mother with either panic disorder or depressive disorder.

Taken together, parental internalizing disorders, which are amongst the most common disorders of affective dysregulation, have a long-lasting impact on their young children's regulatory capacity development. Such impact is evident both neurologically and behaviorally.

2.2.2. Maternal Post-Traumatic Stress Disorder (PTSD) and Children's Self-Regulation

While the previous section reviewed literature related to mothers with anxiety disorders, there is another anxiety-related disorder that is worth specific attention. That is, individuals' lack of affective dysregulation may also evident be by their difficulties adjusting to or recovering from previous traumatic and/or stressful events. In the context

of caregiver-child relationship, such affect dysregulation has also been shown to predict children's regulatory difficulties.

For example, Lang, Gartstein, Rodgers, and Lebeck (2010) recruited 44 women through local clinic during their pregnancy. All participants completed surveys retrospectively assessing their childhood trauma and psychopathology during their pregnancy and later surveys on their infants' temperament after the birth of their children. They found that mothers' early abuse experience (physical and emotional) were associated with their infants' low frustration tolerance and difficulties recovering from distress. Similarly, studying 105 mothers who have experienced interpersonal trauma, Schwerdtfeger, Larzelere, Werner, Peters, and Oliver (2013) found significant association between mothers' PTSD symptoms and their toddlers' affective symptoms. In another study, among mothers exposed to Hurricane Katrina and its aftermath during pregnancy, Tees, Harville, Xiong, Buekens, Pridjian, & Elkind-Hirsch (2010) reported positive associations between these women's PTSD and depressive symptoms and their infants' difficult temperament at 12 months of age. When comorbid with other disorders of affective dysregulation, Chemtob, Nomura, Rajendran, Yehuda, Schwartz, & Abramovitz (2010) reported that children of mothers with both PTSD and depression demonstrated poorer emotion regulation and greater behavioral problems than children of mothers with depression alone or with neither disorder. In short, the above evidence indicated that young children's self-regulation may be compromised through the indirect exposure to their mothers' early trauma experience.

2.2.3. Paternal Psychopathology and Children's Self-Regulation

As reviewed above, past literature has mostly concerned the influence on child regulatory outcomes from mothers' psychopathology. In the meantime, the impact of fathers' psychopathology has been largely overlooked until recently. Nevertheless, it is estimated that 2.3%-12% of fathers were identified to experience depression in the prenatal period, and 5.4%-13.6% of fathers experienced depression in the postnatal period (for a review, Top, Cetisli, Guclu, & Zengin, 2016). Importantly, epidemiological studies have consistently suggested the high likelihood of co-occurring mental illnesses within couples (Dierker, Merikangas, & Szatmari, 1999), with one possible explanation that women with depression were more likely to choose spouses with depression, substance use disorders, or antisocial personality disorder (Gotlib & Hammen, 1992). The non-negligible prevalence of paternal psychopathology and the high likelihood of co-existing psychopathology in the household makes it essential to take into consideration of *both* maternal and paternal psychopathology in influencing offspring's regulatory capacity development. In fact, as early as in 1997, researchers have identified the similar negative impact of paternal depression on child outcomes. Utilizing comparable samples from 50 depressed fathers, 41 depressed mothers, and 50 control families, Jacob and Johnson (1997) found that paternal and maternal depression were similarly associated with their children's internalizing and externalizing problems during middle childhood.

In the past few decades, both qualitative reviews (e.g., Phares, Duhig, & Watkins, 2002) and quantitative meta-analyses (e.g., Kane & Garber, 2004) concluded that paternal depression and depressive symptoms are significantly associated with children's internalizing and externalizing disorders. Nevertheless, the majority of the current

literature on the offspring outcome of paternal depression focuses on middle childhood to adolescent stages. Similarly, the emerging literature on fathers' externalizing disorders, including alcohol and drug dependence/abuse, has suggested that these paternal disorders are associated with a range of adolescent behavioral difficulties, such as substance use (Cho, 2018; Nadel & Thornberry, 2017), alcohol use (Cho, 2018), delinquency (Trucco, Colder, Weiczorek, Lengua, & Hawk, 2014), and even higher likelihood for attemping suicide (Conner, Bossarte, et al., 2014).

Nevertheless, within the current literature on the impact of paternal psychopathology on child outcomes, there are emerging evidence that young children's regulatory capacity may also be compromised in the offspring of fathers with a history of psychopathology. Recently, Gentile and Fusco (2017) reviewed 23 studies on paternal depression and concluded that paternal depression, just like maternal depression, is associated with an increased risk for a range of developmental, behavioral, and psychiatric problems in infants and toddlers. For instance, for newborns, researchers found that prenatal paternal depressive symptoms were predictive of infants' excessive crying (van den Berg, van den Ende, et al., 2009), excessive fussiness and difficulties to calm down (Davé et al., 2005). In terms of the impact of fathers' externalizing symptoms, Eiden, Edwards, and Leonard (2004) studied 226 families with fathers with and without alcoholic problems and found that toddlers of alcoholic fathers exhibited lower levels of effortful control, compared to their counterparts with non-alcoholic fathers.

In addition, some studies are now explicitly addressing the potential differential impacts of maternal versus paternal psychopathology on child outcomes. For instance, studying the effects of parents' psychological distress, Fluori, Sarmadi, and Francesconi

(2019) concluded that, although paternal psychological distress also showed a robust negative effect on child emotional and behavioral problems at 3 years old, this effect was weaker than that of maternal psychological distress. Other studies have suggested a cumulative effect on child outcomes when both parents present with mental health struggles (Paulson, Dauber, & Leiferman, 2006). Therefore, when concerning the inter-generational risk transmission of parental psychopathology, it is essential to consider both mothers' and fathers' history of psychopathology, which allows the close examination of the potential differential effects as well as the cumulative effects of maternal and paternal history of mental illnesses on their offspring.

2.2.4. Summary

Reviewing studies from multiple disciplines spanning over 75 years on the intergenerational transmission of self-regulation, Bridgett, Burt, Edwards, and Deater-Deckard (2015) concluded that there is a positive association between parent and child regulatory capacity. Parental disorders of affect and behavioral dysregulation are marked by the caregivers' lack of regulatory capacity and therefore are likely to lead to emotional and behavioral dysregulation in their offspring. The literature in the past few decades have supported such conclusions, by demonstrating, for instance, that children of parents with disorders of affective dysregulation (e.g., depression, anxiety, PTSD) are at greater risks for experiencing difficulties in their own physiological, emotional, and behavioral regulation. Such regulatory difficulties are typically seen as indicators of risks for future psychopathology. In fact, Beardslee and colleagues (1998) stated that children with parents suffering from affective disorders have a 40% chance to develop an episode of

major depression by the age of 20. For externalizing disorders, Hicks, Krueger, Iacono, McGue, and Patrick (2004) found a high cross-generational transmission of externalizing disorders, as well as significant disorder-specific vulnerabilities for offspring for conduct disorder and alcohol and drug dependence. The same research team further discovered that offspring of alcohol and drug dependent parents are at 2-3 times more likely to develop an externalizing disorder (Marmorstein, Iacono, & McGue, 2009). Given such prominent impact from parents' disorders of affective and behavioral dysregulation to their children's regulation difficulties, it has become increasingly clear to researchers that studying the mechanisms underlying this association is necessary, especially within the context of the family.

2.3. Psychopathology and Child Self-Regulation across Three Generations

As longitudinal studies have progressed, researchers have also started to address continuities in psychopathology in the family beyond the parent-child generation. In other words, the continuity of mental health and adjustment problems may not be limited to two generations as it has been documented to occur at least across three generations (Caraveo, 2014). In fact, with respect to studying psychopathology and symptomotology across three generations, Caraveo (2014) provided the following rational:

> "All common psychiatric disorders where a genetic basis is suspected correspond to the so called "complex disorders". These are the result of the interaction between genetic liability and environmental factors." […] "Intergenerational studies have become of special interest, as heritable risk and early childhood biological markers of emotional disorder may be passed across consecutive

> generations (e.g., temperamental variables, elevated cortisol levels). In a like manner, psychosocial characteristics that increase the risk of emotional and conduct disturbances may be passed from parent to child via processes such as modeling and direct communications. To the extent that these genetic, biological, and psychosocial characteristics— and their attendant risk—are transmitted from one generation to the next, an intergenerational mediation model may best characterize the development of psychopathology in general as well as for specific disorders (i.e., G1 – G2 – G3)." (p.1)

To date, only a limited number of studies have examined familial transmission of risk for psychopathology across three generations. Commonly, these studies define grandparents as generation 1 (G1), parents as generation 2 (G2), and children as generation 3 (G3). In addition, as the current multi-generation studies concern risks for psychopathology, these studies typically consider children's internalizing and externalizing symptoms to represent the indications for future developmental psychopathology outcomes. This representation is well supported by Eisenberg's theoretical framework on self-regulation, which suggests that internalizing and externalizing symptoms do reflect difficulties in regulatory capacity, as internalizing symptoms represents over-regulation and externalizing symptoms represents under-regulation (for a review, Bridgett, Burt, Edwards, & Deater-Deckard, 2015). As such, review on these variables is able to shine some light, albeit indirectly, on the central questions of the current dissertation.

Many studies primarily focus on G2's mental health state and investigate the association of familial psychiatric symptoms between generations on either direction: i.e.,

backwards in regards of proband's parents or forwards in regards of their children. For example, using a variety of mental health measures included in the 1970 British Cohort Study, Johnston, Schurer and Shields (2011) found a grandparent-parent (i.e., G1-G2) and parent-child (i.e., G2-G3) intergenerational mental health correlation of about 0.2 (Hancock, Mitrou, Shipley, Lawrence, & Zubrick, 2013). Caraveo (2014) recruited a G2 sample size of almost 2000 with a total G3 of 1686, and reported moderate associations between G1-G2 as well as between G2-G3 when depressive symptomotology is concerned.

Other studies concern G3 symptoms as the main dependent measures. Many of these studies adopted a definition of familial psychopathology across generations as: Psychiatric history only in grandparents (G1); psychiatric history only in proband (mother or father, G2); psychiatric history on both previous generations (G1 x G2). In a large community sample of preschoolers, Cents, Kok, et al. (2014) reported that, independent of G2 psychopathology, G3 lifetime anxiety and depression predicted both internalizing and externalizing problems in their 3-year-old grandchildren (G3). Similarly, even after controlling for elevated psychological distress in G2, Hancock et al. (2013) reported that a history of broadly defined nervous and emotional mental health problems in grandparents (G1) is associated with elevated emotional and behavioral difficulties in grandchildren (G3). Also with a large community sample, Hammen, Shih, and Brennan (2004) focused on the influence of maternal grandmothers (G1) and mothers (G2)'s depression in adolescent grandchildren (G3). Their results yielded a significant association of depressive symptomotology between G1 and G3; however, this association was fully mediated by G2 depression.

Furthermore, Olino, Pettit, Klein, Allen, Seeley and Lewinsohn (2008) assessed G3's problem behaviors at a much younger age (24 months) and included psychopathology information from the entire G1 and G2 pedigrees (using the same sample that is the basis for the current dissertation). Their results not only corroborated the findings that (a) parental and grandparental depression are both associated with G3 symptoms, and (b) even in the absence of G2 depression, G1 depression has an overarching effect on the G3's problematic behaviors. Importantly, Olino et al. (2008) emphasized that such effects are detectable as early as when G3 were two years of age. Additionally, Capaldi, Pears, Kerr, Owen, and Kim (2012) reported psychopathology in early generations (G1 and/or G2) not only modestly associates with G3's internalizing and externalizing symptoms, as consistent with other findings; additionally, the researchers found an association between G1 psychopathology and the developmental trajectory (in terms of intercept and slope) of internalizing and externalizing symptoms in G3.

It is worth noting that majority of above studies also reported a cumulative effect of psychopathology in G1 and G2 that leads to exacerbated G3 problematic behaviors. Specifically, Pettit, Olino, Roberts, Seeley, and Lewinsohn (2008) reported that G1 depression conferred risk for G2 depression, but not for G3 internalizing or externalizing problem behaviors. Nevertheless, their data revealed an interaction between G1 and G2 depression in predicting higher G3 anxious-depressed scores such that scores were highest among children with both depressed parents and grandparents. Similarly, Cents, Kok, et al. (2014) also found a cumulative impact in the grandparent generation, where each additional grandparent with a lifetime history of psychiatric disorder, the risk of both internalizing and externalizing problems for children increased by a factor of 1.6–

1.7. Weissman et al. (2005) also reported a consistent interaction effect: with their longitudinal retrospective cohort study of 3 generations, the investigators found the biological offspring with two previous generations affected with depression were the highest-risk group, with more than a three-fold increased risk of major depression disorder. Interestingly, Hancock et al. (2013) failed to find a significant interaction between G1 and G2 mental health in predicting G3 problem behaviors; rather, the researchers suggested a cumulative impact for 8- to 9-year-old G3 of having two G2 parents, as opposed to having only one, with elevated psychological distress.

Together, the existing studies have established a modest association of psychopathological symptoms among three generations, but have yet to agree upon the pathways or the specificity of these associations. Regardless, these results did underscore the role of a family history – including not only G2 parental history but also the G1 grandparental generations – on G3 children's social and emotional wellbeing. With the recognition of cross-generation transmission of risks for developmental psychopathology, researchers started to wonder *how* this transmission occurs, with one of the most recognized mechanisms being parental behaviors. Given the current lack of clarity among findings regarding to three-generation psychopathology transmission, the rest of reviews focused on parental behaviors as a mechanism between parental psychopathology and child regulatory outcomes (i.e., two-generation transmission).

3. Parental Behaviors as the Mechanism of Risk Transmission

3.1. Definition of Mechanism

Goodman (2015) emphasized that in addition to describing the association between maternal disorders of affective dysregulation and child self-regulatory outcomes, identifying mechanisms is also central to understand the underlying processes by which maternal psychopathology has its effects. Similarly, from a developmental psychopathology perspective, Cicchetti and colleagues (e.g., Cicchetti, 1984; Cicchetti & Hinshaw, 2002; Cicchetti & Toth, 1992, 2006) have called for an understanding of pathways toward as well as away from risks, which is essential in informing adaptive development and preventative interventions. Within such context, we adopt the conceptualization of a *mechanism* as an intervening or causal variable by which maternal psychopathology has its effects on child outcomes (Baron & Kenny 1986; Holmbeck 1997; Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). Methodologically speaking, statistical mediation has commonly been used to empirically explore mechanisms (Goodman, 2007), such that a mediation is considered to establish whether the independent variable correlates significantly with the mediator and subsequently, the mediator correlates significantly with the outcome (dependent) variable after controlling for the initial variable, thus establishing a significant indirect path between the independent and dependent variables via the putative mediating variable.

In their influential paper on intergenerational transmission of depression, Goodman and Gotlib (1999) developed a theoretical model incorporating four broad categories of mechanisms through which risks might be transmitted from parents to offspring: (a) heritability of the disorder, (b) innate dysfunctional neuroregulatory mechanisms, (c)

exposure to negative maternal cognitions, behaviors, and affect, and (d) the stressful context of the children's lives. Specific to child self-regulation as a developmental outcome, this theoretical model resembled Rothbart and Derryberry (1981)'s theoretical framework that suggested children's problematic self-regulation may stem from both biological makeup of the organism and may also be influenced over time by heredity, maturation, and experience (Rothbart & Bates, 2006; Rothbart & Derryberry, 1981). Among these broad categories of proposed mechanisms, parental behaviors are often recognized as one of the most proximal and influential aspects in a child's self-regulation development (Luthar, Crossman, & Small, 2015), particularly during the early years when parental inputs are essential for children's healthy development. In fact, Eisenberg (2005) summarized that, although individual differences in self-regulation are partly due to heredity, the early socializers (i.e., parents) largely shape the emergence of this regulatory capacity. Therefore, with the awareness that other important underlying factors exist for the development of self-regulation, the rest of the literature review focuses on parental behaviors as the mechanism between parental disorders of affective and behavioral dysregulation and child regulatory outcomes (Figure 2). As opposed to the parenting styles proposed by Baumrind (1991), in the current dissertation, I operationalize parenting as a series of interactional behaviors and patterns between parents and children for the purpose of promoting and supporting the physical, emotional, social and intellectual development of a child (Brooks, 2012), termed parental behaviors.

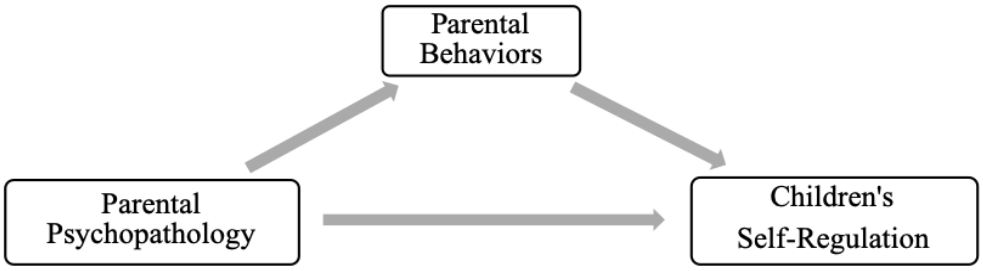

Figure 2. Mediation Model

3.2. Parental Behaviors and Children's Self-Regulation

For human children, especially early in life, a majority of the environmental input is provided by their caregivers. In fact, human children have the longest period of dependence upon caregivers of any mammal (Posner & Rothbart, 1998). This is especially true where regulatory capacity development is concerned, because the operation of self-regulation is closely tied to the actions and perceptions of caregivers, from the simplest to the most complex levels (Bosquet Enlow et al., 2011; Rothbart, 1989a, 1989b).

As reviewed earlier, self-regulation manifests differently at each developmental stage, and therefore benefits from distinctive aspects of caregiver input, including but not limited to parental sensitivity, warmth, and quality in parent-infant interaction (e.g., Eisenberg, Cumberland, & Spinrad, 1998; Hill-Soderlund & Braungart-Rieker, 2008; Lengua, Honorado, & Bush, 2007). During the first year of life, distress regulation is a major developmental task for human infants (Posner & Rothbart, 1998). At this stage, infants display limited self-regulation, mainly regulating their levels of distress and pleasure through reflex withdrawal, approach, and attentional orienting (Rothbart, 1989b). However, these strategies are often insufficient for maintaining infants' own

emotional homeostasis. Therefore, to compensate for infants' relative lack of self-regulatory capacity, caregivers provide external controls upon the infants' behaviors and use their distress reactions as a guide for their soothing intervention, such as picking up the infant, tactile stimulation and rhythmic movement (Rothbart, 1989b). These positive caregiving behaviors have been shown to be important for shaping children's initial behavioral and emotional regulatory control, as infants are exposed to this repeated modeling of effective distress control early in their lives (Crockenberg & Leerkes, 2004; Posner & Rothbart, 2000; Propper & Moore, 2006; Schore, 2003).

Beyond the first year of life, sensitive parental behaviors continue to demonstrate importance for the development of child emotional and behavioral related regulation (Bridgett, Gartstein, et al., 2011). At this developmental stage, infants recognize and start actively utilizing their caregivers as sources of regulation. For example, they continue to be dependent on their caregivers' ability to notice, recognize, and respond to their needs for assistance with regulatory functions (Hoffman et al., 2006). More importantly, they gradually learn to participate in co-regulatory dyadic processes that lead to the independent capacity of *self*-regulation (Beebe, 2011; Beeghly et al., 2011). What's more, warm and supportive parental behaviors positively relate to children's self-regulation not only concurrently (Belsky, Pasco Fearon, & Bell, 2007; Li-Grining, 2007; Spinrad, Eisenberg, et al., 2007) but also longitudinally (Spinrad, Eisenberg, et al., 2012; Valiente, Eisenberg, Spinrad, Reiser, Cumberland, Losoya, & Liew, 2006).

3.3. Parental Psychopathology and Parental Behaviors

On the other hand, when certain caregiver behaviors and inputs are disrupted, children's regulatory capacity may be compromised. One of the most prominent predictors of disrupted parental behaviors is parental mental illness. Numerous studies have documented the negative impact that maternal depression may have on a child's emotional reactivity and emotion regulation (Beck, 1996; Brand & Brennan, 2009; Davis, Snidman, Wadhwa, Schetter, & Sandman, 2004; Field, 2010), and this link is likely to be mediated by disrupted parental behaviors, as demonstrated in Figure 2 above. Indeed, Goodman and Gotlib (1999) stated that problematic parental behaviors may be "one of the strongest mediators of the association between depression and other disorders or stressors in parents and their infants' vulnerability to later development of psychopathology. […] As depression symptom levels increase, mothers subsequently engage in fewer of the parenting qualities associated with healthy infant development (e.g., sensitive, warm parenting) and more of the parenting qualities known to interfere with healthy infant development (e.g., disengaged or harsh/intrusive parenting." (p. 401). Later, this model was extended to parental disorders of affective dysregulation other than depression. For instance, Linehan's (1993) developmental model of borderline personality disorder suggested that parents' insensitive responses to the children's emotions likely trigger children's difficulties in regulating their own emotions later on in life. Furthermore, literature also suggested similar effects for fathers, such that paternal depression is associated with compromised parenting pattern (Sethna, Murray, Netsi, Psychogiou, & Ramchandani, 2015), increased physical abuse (Davis, Davis, Freed, & Clark, 2011), and fewer positive father-infant interactions (Paulson et al., 2006).

In the following sections, literature is reviewed and grouped into different aspects of parental behaviors, given the possibility that that each aspect may serve distinctive roles in promoting and supporting children's adaptive self-regulation development.

3.3.1. Warmth and Sensitivity

The affective quality of the parent-child relationship has been one of the most commonly studied aspects of parental behaivors, and is usually described along the dimensions of warmth versus negative affect (Kiff et al., 2011). The warmth dimension reflects parents' positive affect, appreciation, affection, availability, responsiveness and involvement with their children. On the basis of microanalytic studies, Beebe, Jaffe, & Lachmann (1992) formulated a middle-range model, which assumes that child's development is facilitated by positive and warm parent-child contingent interactive coupling, as reflected in eye contact, physical expression, body movement, and vocalization at a level of mid-intensity, which is neither under- nor over-stimulating (Reck, Hunt, et al., 2004). Researchers suggest that warm and supportive parental behaviors foster psychological well-being in children. This has also been proven true when children's regulatory outcomes are concerned. For example, numerous empirical studies have concluded that maternal warmth and sensitivity predict positive self-regulation capacity in early childhood (e.g., Braungart-Rieker, Garwood, Power, & Wang, 2001; Clark, Woodward, Horwood, & Moor, 2008; Colman, Hardy, Albert, Raffaelli, & Crockett, 2006; Cumberland-Li, Eisenberg, Champion, Gershoff, & Fabes, 2003; Eiden et al., 2004; Feldman, Greenbaum, & Yirmiya, 1999; Halverson & Deal 2001; Karreman, van Tuijl, van Aken, & Dekovic, 2008b; Kochanska, Murray, & Harlan,

2000; Lengua et al. 2007; Olson, Bates, & Bayles, 1990; Spinrad, Eisenberg, et al., 2007).

Conversely, environments laden with feelings of negativity and diminished warmth lead to children's dysregulation (Downey & Coyne 1990; Herman & McHale 1993; Siqueland, Kendall, & Steinberg,1996). For instance, infants with less sensitive and warm mothers and those with mothers who display hostility during mother-child interaction are more likely to show elevated cortisol levels following the exposure to stressors, increased difficulties regulating distress during challenges (Little & Carter, 2005) and lower self-regulation in general (Calkins, Smith, Gill, & Johnson, 1998; Olsen, Yang, Hart, Robinson, Wu, Nelson, & Wo, 2002). In their research, Cohn and Tronick (1983) asked caregivers to simulate depression for three minutes with their infants, where mothers were asked to speak in a monotone, to keep their faces flat and expressionless, to slouch back in their chair, to minimize touch, and to imagine that they felt tired and blue. The researchers found that infants were exquisitely sensitive to the emotional states of their caregivers and subsequently displayed not only initial but also long-lasting distress and disengagement from mothers even after normal interactive behaviors were resumed. This research provided an important demonstration that when infants as young as three-month-old are exposed to maternal social and emotional unavailability, they demonstrated disrupted emotional expression as well as regulation (Cohn & Tronick, 1983). Similarly, chronic parental unresponsiveness can also dysregulate infants' affective states, which may contribute to the development of infants' representation of their parents as unreliable and unavailable, and of themselves as ineffective and helpless. Consequently, they may develop a self-directed style of coping that is deployed defensively and automatically in

an effort to preclude anticipated negative emotions even in situations in which negative affects may not occur (Weinberg & Tronick, 1998).

The lack of warmth, sensitivity and emotional availability in parental behaviors described above have been often observed among parents with disorders of affective dysregulation. As early as 1987, the UCLA High Risk Study assessed children of unipolar, bipolar, chronically medically ill, and healthy mothers at six-month intervals over a three-year period, and found that mothers experiencing bipolar and unipolar affective disorders tended to be more irritable and hostile toward their children at baseline assessment (Hammen, Gordon, Burge, Adrian, Jaenicke, & Hiroto, 1987). This result has been largely replicated over the next few decades. In a meta-analytic review of 46 observational studies of parental behaviors and depression in mothers, small but significant effect sizes were found for associations between depression in mothers and more negative parental behaviors, including lower levels of sensitivity, lower levels of emotional availability and higher levels of hostility and intrusiveness (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Additionally, using videotapes of parent-child interaction, it was observed that non-depressed parents engage in face-to-face interaction play behavior that features vocalizing, smiling, imitation and game playing (Field, Diego, & Hernandez-Reif, 2006). By contrast, mothers with depression tend to show less frequent positive facial expressions, more frequent negative facial expressions, less frequent vocalization, less direct eye contact and to provide less tactile stimulation (Field, 2002, 2010). It is especially worth noting that less warm and sensitive parental behaviors in the context of maternal depression is particularly detrimental to children's regulatory development (behavioral and neurological) during the first year of life (Martinez-Torteya,

Dayton, et al., 2014). Although limited, studies on paternal depression reported similar findings. That is, it was shown that, as comparable with maternal depression's effect, paternal depression also has significant effects on fathers' parental behaviors, with depressed fathers demonstrating fewer positive interaction with their infants (Paulson et al., 2006), decreased positivity and increased negativity in observed parental behaviors (Wilson & Durbin, 2010).

Another parent group who are at risk for low warmth and insensitive parental behaviors is those with early trauma history and/or who are experiencing post-traumatic stress symptoms. Asking 44 women to self-report on their trauma experience, PTSD symptoms, and parental behaviors and parenting competence, Lang et al. (2010) found that mothers who experienced physical abuse in childhood reported higher levels of negativity towards their children during daily interactions. Other research also suggested that traumatized women experiencing PTSD symptoms engage in less sensitive parental behaviors than their non-traumatized counterparts (Levendosky & Graham-Bermann, 2001), potentially due to heightened fear responses to trauma-related triggers, which results in more frequent frightened or frightening behaviors during interactions with their children that may set these children up for future self-dysregulation (Cassidy & Mohr, 2001).

3.3.2. Accuracy in Interpreting Children's Emotions and Needs

The aspects of parental behaviors reviewed above reflect the historical view that the most important differences in parental behaviors usually can be described by two dimensions: (1) parental control behaviors and (2) parental behaviors that convey affect

toward the child (e.g., Frick, 1994; Loeber & Stouthamer-Loeber 1986; Maccoby, 2000; McLeod, Weisz, & Wood, 2007). In further operationalization of parental sensitivity, subsequent research has been increasingly focused on parental behaviors that are in response to children's emotions (including acknowledging, supporting, and guiding children's emotional responses; Kiff et al., 2011) as another essential aspect for assisting children's self-regulatory capacity development. Specifically, such response may be manifested in the form of accurately recognizing children's emotional needs, providing appropriate emotion coaching, and being emotional available and responsive (e.g., Gottman, 1997). In fact, it has been shown that a mother's ability to accurately identify and sensitively respond to her infant's different emotional cues allows her to soothe or regulate an infant's emotional experiences (Gunnar & Donzella, 2002; Gunnar & Quevedo, 2007; Schore, 2001a; Spinrad, Stifter, Donelan-McCall, & Turner, 2004). This capacity is recognized as fundamental to the healthy cognitive, social, and emotional development of an infant (e.g., Perry, 2002; Schore, 2001a, 2001b; Siegel, 2001).

However, among depressed mothers, higher levels of depressive symptomotology were significantly associated with compromised accuracy in interpreting babies' facial expressions, particularly positive facial expressions (Broth, Goodman, Hall, & Raynor, 2004). Similarly, Gil, Teisssedre, Chambres, and Droit-Volet (2011) reported negative misattribution of neutral infant expression among mothers with anxiety disorders. Namely, studies of mothers with postnatal mood disorder have revealed that they tend to rate negative infant faces as more negative (Stein, Arteche, Lehtonen, Craske, Harvey, Counsell, & Murray, 2010), and neutral infant faces as sadder and less neutral; further,

with increasing maternal anxiety, angry infant faces are more frequently recognized as disgust (Gil et al., 2011).

Such biased emotion recognition is even more prominent among women who experience disturbances in social cognition, particularly associated with emotion perception (Preißler, Dziobek, Ritter, Heekeren, & Roepke, 2010), especially for negative emotions such as sadness, anger, disgust, and fear (Bland, Williams, Scharer, & Manning, 2004; Levine, Marziali, & Hood, 1997). These mothers are often observed to experience difficulties with labeling and responding to infant emotional communication, and parental reflective capacity, that is, understanding the inner emotional world of the infant (Slade, 2005; Slade, Grienenberger, Bernbach, Levy, & Locker, 2005).

3.3.3. Reactions and Feedback towards Children's Distress

A caregiver's attitude toward child's emotion and emotional displays influences the development of the child's beliefs about the meaning of emotion (Thompson & Meyer, 2007), which again in turn influences the development of the child's emotion regulation capacity. For example, the "emotion coaching" styles of parental behaviors, which are marked by an approach to emotional expression that is open, supportive, and educational, has been associated with higher basal vagal tone in five-year-old offspring, predicting subsequently more effective emotion regulation three years later (Gottman & Katz, 2002; Gottman, Katz, & Hooven, 1996). Recent work has corroborated this line of work by demonstrating that quality of maternal caregiving when the infant is in a distressed state, such as following the still-face episodes, may have particular impacts on the development of the child's psychophysiological functioning and, consequently, ability to self-regulate

(Conradt & Ablow, 2010). In contrast, caregivers' punitive or dismissive reactions toward their preschoolers' emotional displays have been associated with poorer emotion regulation (Eisenberg et al., 1998), and associated with the use of avoidant coping strategies with their four- to six-year-old children (Eisenberg & Fabes, 1994). Thus, caregiver reactions to child emotional displays appear to influence the child's use of reactive versus effortful emotional control strategies in stressful situations (Eisenberg et al., 1998).

Maternal emotion dysregulation, as evident in disorders of affective dysregulation, may influence these mothers' responses to their children's emotional distress, interfering with their ability to respond adaptively to such distress (Kiel, Gratz, Moore, Latzman, & Tull, 2011). Specifically, one research found that mothers who reported greater difficulties engaging in adaptive coping skills showed increased negative emotional reactions to their infants' distress (Leerkes & Crockenberg, 2006). Likewise, research indicates that engagement in sensitive behaviors in response to infant distress requires adequate maternal emotion regulation skills (Hill-Soderlund, Millls-Koonce, Proper, Calkins, Granger, & Moore, 2008).

Take maternal depression as an example. As children develop, parents provide feedback to assist them in understanding and interpreting the meaning of life events. The provision of negative parental feedback about the causes or consequences of events in children's lives, as is likely to happen among parents with depression, is associated with more negative cognitive styles and enhanced risk of emotional distress in children (Mezulis, Hyde, & Abramson, 2006; Murray, Woolgar, Cooper, & Hipwell, 2001). Utilizing the Still Face Paradigm, especially from observation of parent affect during the

reunion phase, Weinberg & Tronick (1998) found parents with depression were more likely to perceive the interaction negatively and demonstrated a tendency to show more anger in response to their infants' distress than control mothers without depression. These findings suggest that mothers with depression may find it difficult to repair the interaction after it had been disrupted by the still-face phase. Another opportunity for parents to intervene in children's distress is during conflict situations. Kochanska, Kuczynski, Radke-Yarrow, & Welsh (1987) observed free play among mothers with depression and their preschool-aged children and found that, when their children resist their controlling attempts, depressed mothers avoid confrontation, either immediately dropping their original demands or persisting at their controlling ateempts but failing to achieve a mutually negotiated compromise.

3.3.4. Parental Control and Intrusiveness

Parents' effective use of control strategies has also been shown to be essential for their children's healthy regulatory capacity development (Karreman, van Tuijl, van Aken, & Dekovic, 2008a; Lengua et al. 2007; Olson et al. 1990). Several parental control behaviors are considered relevant to children's adjustment. One component of parental control are behavioral control strategies. Such strategies, such as limit setting, reflect parents' efforts to restrict and manage children's behaviors by monitoring children's activities, conveying rules or standards for appropriate or desirable behaviors, employing reinforcement for these appropriate or desirable behaviors and consequences for inappropriate behaviors, as well as engaging in these behaviors with a degree of consistency (Kiff et al., 2011). Such clarity and predictability of expectations and their

enforcement allows children to more readily internalize rules and expectations, which facilities children's later regulation of behaviors and emotion (Kiff et al., 2011; Lengua, Kiff, Moran, Zalewski, Thompson, Cortes, & Ruberry, 2014). Parental control may take the form of psychological control as well, defined as parental control attempts that intrude into a child's psychological and emotional development by stifling his/her independent thinking and self-expression (Barber, 1996; Barber and Harmon 2002; Stone, Buehler, & Barber, 2002). In their study, Silverman and Ragusa (1990) demonstrated that parental autonomy granting was significantly associated with children's better ability to inhibit preferred responses (i.e., delay response).

On the other hand, these parental behavior patterns predict children's emotional and behavioral dysregulation when parents' control behaviors are intrusive (Colman et al., 2006), inconsistent (e.g., Barber 1996; Chamberlain & Patterson 1995; Hill, Bush, & Roosa, 2003), harsh or coercive (e.g., Nix, Pinderhughes, Dodge, Bates, Pettit, & McFadyen-Ketchum, 1999), or when parents use physical punishment as a means of control (e.g., Deater-Deckard, Dodge, Bates, & Pettit, 1996; Stormshak, Bierman, McMahon, & Lengua, 2000). Further, parental overcontrol is related to children's fearful inhibition (Chen, Hastings, Rubin, Chen, Cen, & Steward, 1998; Coplan, Reichel, & Rowan, 2009). When parents were high in control or protection (i.e., overcontrol), their children reported more adjustment problems suggesting that the external control from parents may not be beneficial anymore when the level of control significantly exceeds the appropriate amount (Degnan, Henderson, Fox, & Rubin, 2008; Hastings, Sullivan, McShane, Coplan, Utendale & Vyncke, 2008). In one longitudinal study, power-based control, including strictness and intrusiveness, predicted lower delay or greater

impulsivity in young children (Houck & Lecuyer-Maus 2004). In another longitudinal study, children whose mothers used relatively non-restrictive clear, consistent, and non-punitive discipline when children were two years old demonstrated better behavioral control and delay of gratification when they were six and eight years old (Olson et al. 1990; Olson, Bates, Sandy, & Schilling, 2002).

When parents suffer from disorders of affective and behavioral dysregulation, the likelihood of them executing inappropriate parental control increases. It was reported that a history of maternal depression was associated with higher levels of maternal criticism and emotional over-involvement (Thompson, Pierre, Boger, McKowen, Chan, & Freed, 2010) as well as higher frequency of harsh punishment (McLearn, Minkovitz, Strobino, Marks, & Hou, 2006) which subsequently increased their young children's risk for experiencing internalizing symptoms. Similarly, fathers with depression, compared with those without histories of depression, were more likely to report harsh controlling behaviors towards their children such as spanking (Davis et al., 2011). Similarly, other studies also suggested conflictual and intrusive interactions between fathers and their offspring as an outcome of these fathers' depressive symptoms, which in turn significantly associates with children's externalizing symptoms (Kane & Garber, 2004).

3.3.5. The Role of Positive Parental Behaviors

As reviewed above, parental behaviors have received great attention in the research field as the mediator for the association between parental disorders of affective and behavioral dysregulation and child regulatory outcomes. One reason that makes researchers interested in exploring the role of parental behavior is its potential for

changes and interventions. In other words, as a mechanistic factor in the link between parental disorders of affective and behavioral dysregulation and child regulatory capacity outcomes, positive parental behaviors have in fact been recognized as one of the most prominent protective factors against the impact of parental mental disorders on children's regulatory capacity outcomes (for a review, Luthar et al., 2015).

Importantly, research has demonstrated that mothers with disorders of affective and behavioral dysregulation do possess the capacity for positive parenting behaviors. For instance, although Cohn and Tronick (1989) described depressed mothers' generally lack engagement and positive affect when interacting with their children, they also identified a group of depressed mothers who are able to mobilize sufficiently to maintain positive mother-child interactions. Importantly, their research indicated that not all depressed women function poorly as parents, and positive parenting within the context of maternal affective disorders may indeed buffer the impact of maternal psychiatric disorder on children's self-regulation. For instance, in a sample of 57 mother-infant dyads of mothers with anxiety disorders, positive maternal behaviors observed during face-to-face interactions were found to buffer the negative impact of maternal anxiety on young infants' behavioral regulation. The authors subsequently concluded that positive maternal interaction behaviors in the context of maternal psychiatric disorders is important in "at least some parts of regulatory adjustment of at-risk infants" (Richter & Reck, 2013, p. 498).

Taken together, although parents with disorders of affective and behavioral dysregulation are at elevated risks for displaying negative parental behaviors that predispose their young children to later emotional and behavioral dysregulation, there are

also strong evidence suggesting their potential for typical parenting behaviors. In other words, given the interactional difficulties of mothers within the same diagnostic category vary, there is an implication and a need for clinical intervention targeting these parents' parental behaviors in the domain of affect, cognitive, and behavior, leading to optimal regulatory capacity development in their offspring.

4. The Current Dissertation

This dissertation aims to expand the current literature on early development of self-regulation and intergenerational transmission of risk for psychopathology by answering the following four research questions. An overall conceptual model incorporating all four questions was shown in Figure 3 below.

4.1. Research Question 1

Research Question 1: What is the developmental trajectory of young children's (i.e., Generation 3; G3) self- regulation from 3- to 24-months?

Hypothesis 1: Young children will demonstrate an overall increasing trend in their self-regulation in the first 2 years of life, with limited self-regulation development within the first year, and then significant growth from 12- to 24-months.

As reviewed above, understanding the course of development of self-regulation during infancy and early childhood is still incomplete. Nevertheless, the early stages of life offer a valuable opportunity for both early identification of children at risk for problematic development of self-regulation, such as offspring of parents with mental illness histories,

as well as for early interventions or preventative interventions targeting these problematic aspects. In the current dissertation, I aim to address this gap by describing the developmental trajectory of young children's self-regulation during the first two years of life using a longitudinal within participants design.

Taking into consideration of the young children's unique developmental stage (i.e., infancy and toddlerhood), in the current dissertation, I operationalize children's self-regulation as reflected in their behaviors: their attention to, interaction, and/or task engagement with a single object or in ongoing solitary play for extended periods of time.

4.2. Research Question 2

Research Question 2: What are the effects of parental history of mental disorders (Generation 2; G2) in predicting the developmental trajectory of young children's self-regulation during the early years?

Hypothesis 2a: The presence of mothers' and fathers' lifetime mental illness history will predict their offspring's poor self-regulation, not only at the initial assessment point (i.e., 3-months), but also a slower self-regulation development rate up until their offspring's second birthday.

Hypothesis 2b: Further, it is predicted that mothers' internalizing disorders will be more strongly negatively associated with children's self-regulation development than mothers' externalizing disorders, and fathers' externalizing disorders will be more strongly negatively associated with these outcomes than internalizing disorders.

Following the description of the developmental trajectory of self-regulation in the first research question, I will then identify parents' history of mental disorders as a risk factor for such development. This research question aims to advance the existing literature in two ways. On the one hand, most studies concern children's self-regulation development at set time points only, with cross-sectional research designs, while overlooking the developing and rapidly changing nature of their regulatory capacity. On the other hand, majority of the current research focused on mothers' influences on children's self-regulation development, quoting their traditional role of primary caregivers in children's lives. Nevertheless, as fathers increasingly involve in child rearing practices and family roles, in the past few decades, researchers started to recognize and advocate for empirical studies examining fathers' role in impacting children's development (Forbes, Cohn, Allen, & Lewinsohn, 2004). Importantly, father influence on children's self-regulation development may be different from that of mothers. Therefore, the second aim of this dissertation proposes to explore maternal versus paternal history of mental disorders in predicting the early development of their children's self-regulation.

In the current dissertation, I aim to examine both mothers' and fathers' internalizing and externalizing disorders as potential risk factors for children's self-regulation development. The operationalization of internalizing and externalizing disorders was driven by the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov, Krueger, et al., 2017) model. The HiTOP model is an alternative to traditional psychopathology taxonomies defined in, for instance, the DSM (APA, 2013). It follows a quantitative psychiatric classification that operates on two levels: first, it constructs syndromes from the empirical covariations of symptoms; and second, it groups syndromes into spectra

based on the covariation among them. In the current dissertation, I operationalize internalizing disorders as representing disorders of affective dysregulation and incorporating disorders on the HiTOP internalizing spectra. These disorders share the characteristics of distress (consists of major depressive disorder, dysthymic disorder, generalized anxiety disorder, and posttraumatic stress disorder), fear (panic disorder, phobic disorder, obsessive-compulsive disorder, separation disorder), and eating pathology (bulimia nervosa, anorexia nervosa, and binge-eating disorder). Of note, although there is emerging evidence that mania and bipolar disorders generally relate to internalizing disorders (e.g., Kotov, Perlman, Gamez, & Watson, 2015), whether the underlying components of mania belongs to internalizing spectra or thought disorder is still yet clear (Kotov, Krueger, et al., 2017). Therefore, to better focus on the internalized affective dysregulation characteristics of mental disorders, bipolar disorders are excluded from the internalizing disorder code in the current dissertation. For externalizing disorders, this dissertation operationalizes them as representing dysregulation on the behavioral level and incorporating disorders on the HiTOP disinhibited externalizing spectra. These disorders share the components of antisocial behaviors (consisting of opposition defiance disorder, attention deficit/hyperactivity disorder, and conduct disorder) and substance abuse (substance and alcohol dependence/abuse).

4.3. Research Question 3

Research Question 3: How does parental behaviors function as a mechanism through which parental psychopathology exerts an influence on the development of children's self-regulation?

Hypothesis 3: G2 parents' psychopathology negatively impact children's self-regulation development through parental behaviors. Specifically, parents' internalizing disorders will be associated with less positive affect, sensitivity, and warmth, and more affect flatness and more disengagement, which will negatively predict children's self-regulation both at 3-months and its rate of development into 24-months. Relatedly, parents' externalizing disorders associate with more intrusiveness, which also predict children's poorer self-regulation both at 3-months and its development rate.

Goodman (2015) emphasized that, in addition to concluding the association between maternal disorders of affective and behavioral dysregulation and child self-regulatory outcomes, identifying mechanisms is also central to understanding the underlying processes by which maternal psychopathology has its effects. Within the association between parental psychopathology and child self-regulation outcomes, researchers have often recognized parent-child interaction as the most proximal and influential aspect (Luthar et al., 2015), particularly during the early years when children's self-regulation moves from reliance on outside sources to a growing capacity for autonomous, flexible, and adaptive regulation (Grolnick, McMenamy, & Kurowski, 2006). Therefore, this research question explores how G2 parental psychopathology affects G3 children's self-regulation development through parent-child intervention. Similar to the second research question, both mother-child and father-child interaction will be taken into consideration.

4.4. Research Question 4

Research Question 4: What are the influences of family mental illnesses on children's self-regulation development beyond the parent-child generation (i.e., Generation 1 – grandparents; G1)?

As longitudinal studies have progressed, researchers have also started to address continuities in familial psychopathology beyond the parent-child generation. In other words, the continuity of mental health and adjustment problems is not limited to two generations as it has been documented to occur at least across three generations (Caraveo, 2014). Following theoretical foundation of three-generation transmission of psychopathology, as reviewed in Chapter 1, the last research question of the current dissertation concerns the origins of G2 caregivers' attitudes, reactions, and strategies of regulation with which they demonstrate with their G3 offspring. Specifically, by considering the effects of G2 psychopathology on G3 self-regulation outcomes in the context of G1 lifetime psychopathology, I aim to explore the overarching impact of family history of mental illness in the following offspring generation. As there are limited literature exploring three-generation psychopathology risk transmission, this last research question is mainly exploratory. Therefore, I present no hypothesis here.

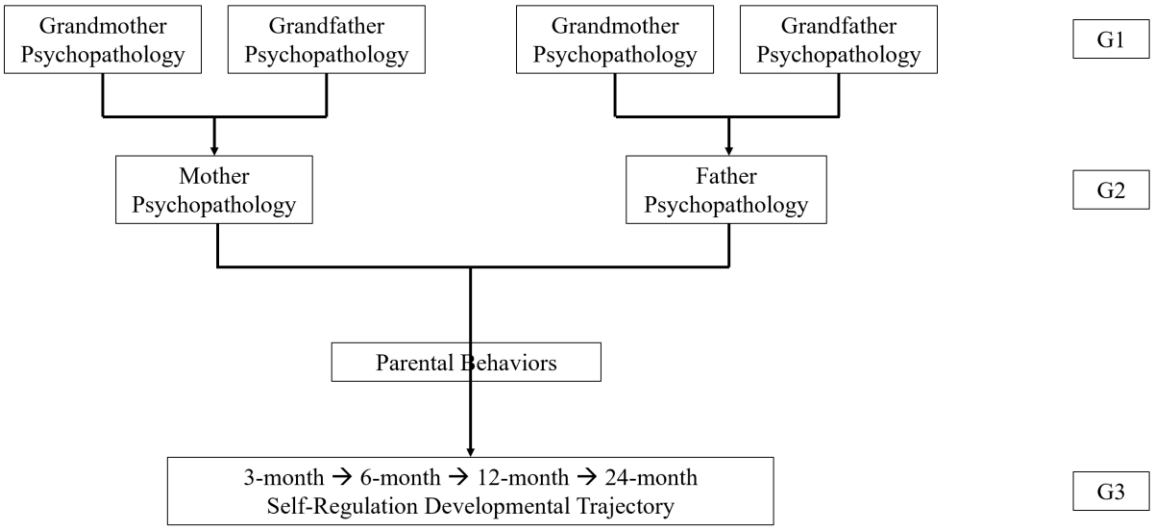

Figure 3. Overall Theoretical Model

Taken together all the research questions together, this dissertation aims to gain a full picture of children's early self-regulation development within the family context of mental illnesses, as modeled in Figure 3. This dissertation advances the current literature on children's self-regulatory capacity by addressing (a) its development trajectory, (b) both maternal and paternal influences as well as grandparents' influences, and (c) parental behaviors as the potential mechanism through which family history of mental illness impacts the developmental course of children's self-regulation in the early years. In addition, importantly, the results of this dissertation will offer valuable intervention potential that allows early identification of those who may be at risk for self-regulation development difficulties and therefore permits the opportunity for early intervention that assist these individuals to reach their fullest developmental potential. In addition, the results of the current dissertation will offer insights on potential differential and targeted parenting intervention strategies for mothers versus fathers.

CHAPTER II. METHOD

1. Participants

The current dissertation is a secondary data analysis study, utilizing data from a series of longitudinal projects (Table 1) examining the natural history, precursors, and the continuity of psychopathology. From the series of longitudinal projects, the current dissertation focuses on the Infant Development Study (IDS) project and the Family History (FH) project.

Both IDS and FH were follow-up projects from the Oregon Adolescent Depression Project (OADP; Grant: Natural History of Depression in Adolescents; 2-R01-MH50522; PI: Lewinsohn, P.M.). As part of the OADP, the initial pool of participants was a representative community sample of 1709 adolescents (ages 14-18 at initial assessment) recruited from nine senior high schools in urban and rural districts of Western Oregon. They participated in three assessments from 1987 to 1999.

At the Time 3 (T3) assessment point, when OADP participants reached approximately 24 years of age, those who had a newborn infant or who became pregnant (n=122) or whose partner became pregnant (n=79) over a three-year recruitment period, and who lived in Oregon, and wished to participate, were recruited into the Infant Development Study (IDS; Grant: Parental Depression and Infant Development; 1-R01-MH56604; PI: Lewinsohn, P.M.). Participation rate for eligible families was 83%. Those who chose to participate in the IDS were less likely to have obtained a bachelor's degree or higher when compared to the full sample of OADP T3 participants (17% versus 33%; $\chi^2(1, n=930) = 12.8, p<.001$). Differences in IDS participation as a function of other

demographic variables at T3 were nonsignificant, and demographics differences between those who did and did not participate were negligible.

At the first IDS assessment, a total of 166 mothers, 152 fathers, and 166 infants participated. This sample of participants were demographically representative of the Oregon population, with 92.8% of mother and 89.3% of father identifying as white, 2.4% of mothers and .7% of fathers as Asian, 1.8% of mother and 6.7% of father as Hispanic, 1.2% of mother and .7% of fathers as black, 1.2% of mothers and 2.0% of fathers as American Indian, .6% of mothers as Pacific Islander, and .6% of fathers as other. There were roughly equal numbers of male and female G3 offspring (male=80, female=86). IDS families brought their children in at ages 3- (Wave 1), 6- (Wave 2), 12- (Wave 3), and 24-months (Wave 4) for questionnaires, diagnostic interviews, and laboratory assessments. Attrition across the four assessment periods was minimal; at Wave 4, 162 (97.6%) mothers, 147 (96.7%) fathers, and 162 (97.6%) children participated. Families participating in IDS were the focus of the current dissertation.

From 1994 to 1999, as part of the Family History project (Grant: Family Study of Adolescent Psychopathology; 1-R01-MH52858-01; PI: Lewinsohn, P.M.), data were collected on the first-degree relatives (biological parents and full siblings) of OADP probands who participated in T3 assessment. Among the families participating in IDS, the G1 grandparents whose diagnostic data were not collected as part of FH study, the same data collection procedure for these G1 grandparents was administered during the first wave of IDS (i.e., 3-month postnatal). Together, diagnostic data were collected on 162 mothers (99 probands and 63 spouses of the proband), 148 fathers (63 probands and 85 spouses of the proband), 152 mothers of probands, 152 fathers of probands, 127

mothers of spouses of probands, and 123 fathers of spouses of probands. Direct interviews were conducted with 67.5% of the mothers of the proband, 41.0% of the fathers of the proband, 67.5% of the mothers of the proband's spouse, and 27.7% of the fathers of the proband's spouse.

Table 1. Timeline of Projects

	1986	1988	1990	1992	1994	1996	1998	2000	2002	2004
G1 (grandparents)						Family History Study (FH)				
G2 (parents/probands)	Oregon Adolescent Depression Project (OADP)									
G3 (offspring)							Infant Development Study (IDS)			

2. Measures

2.1. Procedure

At OADP T3 assessment, the subjects who have an infant under three months old or who are expecting a baby and live in Oregon were considered eligible. Among the eligible families, interested families then enrolled in the IDS study. These IDS families (both biological parents) and their infant visited the laboratory for four waves of assessments: at infant's 3-month (wave 1), 6-month (wave 2), 12-month (wave 3), and 24-month (wave 4). At all assessment waves, a reminder letter and mailer questionnaires were mailed to the family approximately one to two weeks prior to their experiment appointment.

For IDS assessments, all parts of the assessments (direct assessment, diagnostic interview, observation, and questionnaires) were completed within one week before and one week after the infant turned the designated age. If necessary, the window of time was

stretched to two weeks before and after, but only when one week was not an option. If the infant was born three weeks (21 days) or more before the due date, the due date was used to determine the dates of the assessments.

As part of the FH project, each first degree relative of the OADP proband who participated in the IDS study was mailed a descriptive letter of the project, consent form, and mailer questionnaires. After family member returned completed consent forms, they were assigned to an interviewer for scheduling of SCID or FISC interviews (see description below). Family members were compensated $15 for completed questionnaires, $25 for a SCID interview, and $15 for each FISC interviews.

2.2. Assessment of Psychopathology – Generation 2

At IDS Wave 1 (3-months postpartum), lifetime psychopathology in G2 parents were assessed with direct in-person interviews, utilizing the Structured Clinical Interview for DSM-IV Disorders – Patient Edition (SCID; First, Spitzer, Gibbon, & Williams, 1994). The SCID is a widely used semi-structured clinical interview that yields DSM-IV diagnoses for most Axis I disorders. An extensive, multi-site, test-retest reliability study indicated that most diagnoses can be derived with adequate reliability (Williams, Gibbon, et al., 1992).

Personnel administering the SCID diagnostic interviews were carefully selected and trained. The interviewers generally had master's degrees in a mental health field and received extensive training. Prior to conducting interviews, all interviewers were required to demonstrate a minimum k of .80 for all symptoms across two consecutive interviews and on one videotaped interview of a participant with evidence of psychopathology. Based on a randomly selected subsample (25%), interrater reliability was moderate to

excellent: Major Depressive Disorder (k=.71), anxiety disorders (k=.69), alcohol abuse/dependence (k=.86), and drug abuse/dependence (k=.85). Diagnoses were made using Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, American Psychiatric Association, 1994) criteria.

2.3. Assessment of Psychopathology – Generation 1

Lifetime psychopathology in G1 parents (i.e., both biological parents of the OADP probands and their spouses, grandparents to the infants) were assessed with the SCID and the Family Informant Schedule and Criteria (FISC; Mannuzza & Fyer, 1990). Basing on the Family History Research Diagnostic Criteria (FH-RDS; Endicott, Andreasen, & Spitzer, 1978), the FISC assess psychotic, mood, anxiety, and substance use disorders and antisocial personality using DSM-III criteria. While there are few validation data available specifically for the FISC, its precursor, the FH-RDS, has been shown to have good reliability, moderate sensitivity, and excellent specificity when compared to direct interviews in numerous studies (Endicott et al., 1978; Cohen, 1988). In the FH grant, all FISC interviews were supplemented with all items necessary to derive DSM-IV diagnoses.

Similar to assessment of lifetime psychopathology in G2 parents, the SCID was administered to both parents of probands and spouses. To ensure that some diagnostic data were available even for parents who were not personally interviewed and to supplement the direct interviews, psychopathology data on all G1 grandparents were collected from all the G2 probands and spouses and at least one first-degree relative from each family. Because sensitivity of the family history method varies as a function of the

number of informants (Cohen, 1988), additional family history interviews were conducted with all of the available family members regarding relatives who could not be directly interviewed. In cases where relatives were administered both personal and the FISC interviews, the SCID was conducted first to reduce any biases due to the pattern of psychopathology in other relatives. As a result, each G1 grandparent received at least two sets of psychopathology data (e.g., SCID interview and FISC, or two FISCs obtained from two direct relatives of the G1 grandparent). Best Estimate Rating (BER, also known as Consensus Rating; Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982) of DSM-IV diagnoses were derived for all relatives using all available data by two senior diagnosticians (Drs. Lewinsohn and Klein) on the grant. All best-estimates were derived blind to proband diagnoses using DSM-IV criteria.

2.4. Self-Regulation

2.4.1. Infant Behavior Questionnaire

Both G2 biological parents rated G3 infants' temperament with the Infant Behavior Questionnaire (IBQ; Rothbart, 1981, 1986) at waves 1, 2, and 3 (i.e., 3-, 6-, and 12-months postpartum). The IBQ is a structured parental report questionnaire which has been demonstrated to possess good scale internal consistency and convergent validity with home observations of infant temperament. The IBQ consists of 87 items. Each item was rated for the one or two previous weeks on a 1 (never) to 7 (always) scale. A Does Not Apply response option was offered for all items. Following Rothbart (1981)'s operationalization of infants' temperamental traits, six subscales were calculated: distress to novelty, activity level, distress to limitations, soothability, smiling and laughter, and

duration of orienting. Scale constructions allow scores to be constructed for cases if at least 50% of scale items have valid responses. All scales have shown adequate conceptual and psychometric properties (Rothbart, 1981). Among the subscales, as reviewed in the previous section, duration of orienting was operationalized as an early representation of infants' behavioral regulation and was utilized for further analyses in the current dissertation. The items compositing the subscale of *duration of orienting* are listed below.

An average score between G2 mother' and G2 father's reporting on the IBQ at each wave was created for each G3 child. A mean score was taken from the items, with a higher score on the duration of orienting measure indicates the longer orienting duration (i.e., infant fixates on one object/behavior/activity for longer time).

- During the last week, after sleeping, how often did the baby coo and vocalize for periods of 5 minutes or longer?
- How often during the last week did the baby look at pictures in books and/or magazines for 2-5 minutes at a time?
- How often during the last week did the baby look at pictures in books and/or magazines for 5 minutes or longer at a time?
- How often during the last week did the baby stare at a mobile, crib bumper or picture for 5 minutes or longer?
- How often during the last week did the baby play with one toy or object for 5-10 minutes?
- How often during the last week did the baby play with one toy or object for 10 minutes or longer?

- How often during the last week did the baby spend time just looking at playthings?
- How often during the last week did the baby repeat the same sounds over and over again?
- How often during the last week did the baby repeat the same movement with an object for 2 minutes or longer (e.g., putting a block in a cup, kicking or hitting a mobile)?
- How often during the last week did the baby when in a position to see the television set, look at it for 2-5 minutes at a time?
- How often during the last week did the baby when in a position to see the television set, look at it for 5 minutes or longer?

2.4.2. Toddler Behavior Assessment Questionnaire

At Wave 4 (24-months postpartum), both G2 parents completed the Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996), a parent report instrument designed to examine temperament-related behavior in 16–36-month-old children. Rothbart (1981)'s IBQ served as the model for the development of TBAQ. The TBAQ consists of 12 items. Each item was rated for the one or two previous weeks on a 1 (never) to 7 (always) Likert scale. A Does Not Apply response option was offered for all items. The TBAQ calculated subscales include activity level, perceptual sensitivity, inhibitory control, soothability, appropriate attentional allocation, sadness, object fear, anger, social fear, pleasure, and interest/persistence. Scale constructions allow scores to be constructed for cases if at least 50% of scale items have valid responses.

When comparing the IBQ and TBAQ, the rank ordering on most temperament dimensions was significantly preserved from age 12 months, when the IBQ was administered, to age 18 months, when the TBAQ was administered. Asking mothers with children in the transitional age range between IBQ and TBAQ (mostly 15, 16, and 17-month-old) to complete both questionnaires on one occasion, Goldsmith (1996) has shown significant interrelation between comparable scales from the IBQ and the TBAQ. Among the scales, as a comparable scale from the IBQ duration of orienting scale, the TBAQ interest/persistence scale showed significant interrelation (r=.60, p<.05). Therefore, the TBAQ interest/persistence scale was utilized as a continued construct to represent children's self-regulation at Wave 4 and was utilized in all further analyses in the current dissertation. Items compositing the *interest/persistence* scale are listed below.

An average score between G2 mother' and G2 father's reporting on the TBAQ was created for each G3 child. A mean score was taken from the items. Certain items were reversely coded (indicated with (R) in front of the item) before entering the average and mean score calculation, so that in the final subscale score, a higher score indicates the longer a child stays on one object/behavior/activity.

- While playing alone in a sandbox or playing with dolls, how often did your child remain interested for 30 minutes or longer?
- While playing alone in a sandbox or playing with dolls, how often did your child remain interested for 10 minutes or longer?
- (R) While playing alone in a sandbox or playing with dolls, how often did your child remain interested for less than 10 minutes?

- While coloring by her/himself, how often did your child continue to color alone for 20 minutes or more?
- While coloring by her/himself, how often did your child continue to color alone for 10-20 minutes?
- When looking at picture books by her/himself, how often did your child continue to look at the pictures by her/himself?
- (R) When looking at picture books by her/himself, how often did your child lose interest or get bored quickly?
- How often did your child play alone with her/his favorite toy for 30 minutes or longer?
- How often did your child play alone with her/his favorite toy for 10 minutes or longer?
- (R) How often did your child play alone with her/his favorite toy for less than 10 minutes?
- (R) When you told your child that s/he would have to play alone for a short time, how often did s/he require constant encouragement to continue playing alone?
- When you told your child that s/he would have to play alone for a short time, how often did just one activity or object keep her/him busy?
- While playing with a detailed or complicated toy (such as a big doll house or toy garage), how often did your child explore the toy thoroughly?
- (R) While playing with a detailed or complicated toy (such as a big doll house or toy garage), how often did your child become easily bored or restless?

- (R) While playing with a detailed or complicated toy (such as a big doll house or toy garage), how often did your child only give the toy a quick try?
- (R) When your child was involved in a game or activity by her/himself and you interrupted the game because it was mealtime or time for an outing, how often did your child easily move on to what you needed him/her to do?
- While reading a story of average length to your child, how often did s/he pay attention to your reading during the entire story?
- (R) While reading a story of average length to your child, how often did s/he become restless or bored after the first few pages or minutes?
- While watching a favorite children's television program such as Sesame Street, how often did your child pay attention to the whole show?
- (R) While watching a favorite children's television program such as Sesame Street, how often did your child watch only the first few minutes of the show before showing signs of restlessness?
- How often did interesting outdoor sights (such as water sprinklers, birds, or traffic) hold your child's attention for 5 minutes or longer?
- (R) How often did interesting outdoor sights (such as water sprinklers, birds, or traffic) hold your child's attention for less than 5 minutes?

Finally, the IBQ duration of orienting and the TBAQ interest/persistence scales were converted into the same scale for further analyses.

2.5. Parent-Child Interaction Global Rating

During parents' and their infant's first visit to the laboratory (Wave 1; 3 months postpartum), several parental behavioral were coded during unstructured parent-child

times by raters blind to parental diagnoses. Mother-child behavior and father-child behavior were coded independently. Coding systems were based on those used by Dr. Dawson's group. These systems were adapted from previously developed ones by other investigators. These consisted of systems designed to assess several dimensions of parent-child behavior during parent-child interaction (Breznitz & Friedman, 1988; Eyeberg & Robinson, 1983; Kochanska et al., 1987).

Coding of parental behaviors focused on the domains of positive affect and affection, negative affect and negative verbalizations, involvement/engagement, and intrusiveness. Following literature reviews and theoretical foundations, as reviewed in Chapter 1, that suggested the mediating role of certain parental behaviors, the following behavioral codes were utilized to represent mother-child and father-child behaviors utilized in subsequent statistical analyses: positive expression, negative expression, sensitivity, warmth, flatness of affect, disengagement, and intrusiveness. These codes were selected for analyses based on the theoretical rationales indicating these parental behavioral aspects' potential mechanism in linking parental psychopathology and child's regulatory outcomes, as reviewed in Chapter 1 in this dissertation. See below for the operationalizations of each behavior code:

- *Positive Affect* reflects the expressions of positive regards by the parent, including positive affect and/or content of vocalization. A low score means no instances of positive expression were observed throughout the parent-child interaction, and a high score means parent's consistent displays of positive regard in the course of their time together.

- *Negative Affect* reflects the expression of negative regard by the parent, including negative affect and/or content of vocalization. A low score means no instances of negative feelings such as anger, frustration, impatience, disgust, or general dislike being observed in face or voice, and a high score means these feelings of negative regard were expressed often or with high intensity.
- *Sensitivity* reflects the parent's ability to perceive and accurately interpret the infant's signals and to respond to them appropriately and promptly. Sensitivity requires not only that the parent be accessible to the infant, rather than disengaged, but that he/she be alert to subtle aspects of the infant's signals. Sensitive responses are well-timed, reflect empathy with the infant's state and affect. Sensitive behavior is reflected in behavior that will facilitate positive, smooth, and synchronous interactions. On the sensitivity code, a low score means parent always or almost always fails to respond appropriate and promptly, though occasionally may show the capacity for sensitivity, especially when the infant's affect and activity are not too discrepant with his/her own or when the infant displays great distress. A high score means that parent always or almost always respond to the infant appropriately and promptly and that he/she is never seriously out of tune with the infant's state, affect, tempo, or signals.
- *Warmth* reflects the quality of parent's affection toward the infant. It includes the extent to which the parent expresses affection toward the infant in a pleasurable way. Warmth may be apparent in vocal affect or content, expression, or handling. A low warmth score indicates that parent's behavior consistently fails to convey warmth and that parent-child interactions generally lack tenderness, caring, and

affection. A high warmth score indicates that parent's behavior always expresses warmth and that his/her behavior is very tender, caring, and affectionate.

- *Flatness of Affect* of parent measures the frequency and the degree to which flatness of affect (i.e., neither warmth nor hostility) is expressed by facial expression (blank, impassive, expressionless), gaze (looking away from baby or toys, looking at TV or at nothing), vocal expression (flat tone or rarely speaking when engaged with baby), and affect (conspicuously lacking, including hostility). A low flatness of affect score means that parent's affect is always either affectionate or hostile, and a high score means that neither affection nor hostility is ever displayed.
- *Disengagement* measures the degree of parent's disconnectedness from baby as expressed by pacing, body orientation, or initiative. Specific disengagement behaviors may be observed as poor pacing (parent's involvement in play with baby is only sporadic and does not involve turn-taking; parent is slow in responding to baby), body orientation (parent's body position may be partially averted or rigid; positions baby awkwardly; parent keeps distance from baby even when baby expresses desire for closeness), and lack of initiative (parent initiates almost no activities; parent leaves baby doing nothing during much of the interaction; baby controls the play without the involvement of parent' parent does not respond to baby's initiation in a way that furthers the interaction). A low disengagement score means there were little disengaging behaviors observed, a high score means very much disengaging behaviors were observed.

- *Intrusiveness* measures the degree to which the parent's behavior appears to be intrusive and/or irritating to the baby. The behavior generally produces a startle, wince, withdrawal, grimace, or fuss from the baby. A low intrusiveness score means few or no instances of intrusiveness being observed, and a high score means several instances of parent' intrusiveness behaviors were observed.

3. Data Preparation and Analytical Approach

All data was prepared using SPSS 24. Subsequent analyses were performed with SPSS 24 and Mplus 7 (Muthen & Muthen, 2012). G1 grandparents', G2 parents' and G3 infants' data were integrated into one single data file, matching by the initial G2 proband's participation ID from the OADP project. Of note, such data integration resulted in a total sample size of 174 for the current dissertation. This sample size differs from previous publication from the same project (e.g., Olino et al., 2008), as the previous publications focused on IDS participants only.

3.1. Coding for G1 and G2 Diagnostic Data

G1 grandparents' and G2 parents' diagnostic data were recoded into internalizing disorders and externalizing disorders, in the forms of dichotomous dummy codes with 0 representing an absence and 1 representing the presence of lifetime the corresponding psychopathology. As reviewed above, the theoretical rationale underlying these psychopathology recoding was the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov, Krueger, et al., 2017) model. As an alternative to traditional psychopathology taxonomies, the HiTOP taxonomy follows a quantitative psychiatric classification that

operates on two levels: first, it constructs syndromes from the empirical covariations of symptoms; and second, it groups syndromes into spectra based on the covariation among them. From the HiTOP model, the internalizing and disinhibited externalizing spectra were coded and utilized in all following analyses. The internalizing spectra (hereinafter internalizing disorder) shares the characteristics of distress (consists of major depressive disorder, dysthymic disorder, generalized anxiety disorder, and posttraumatic stress disorder), fear (panic disorder, phobic disorder, obsessive-compulsive disorder, separation disorder), and eating pathology (bulimia nervosa, anorexia nervosa, and binge-eating disorder). On the other hand, the disinhibited externalizing spectra (hereinafter externalizing disorder) shares the components of antisocial behaviors (consisting of opposition defiance disorder, attention deficit/hyperactivity disorder, and conduct disorder) and substance abuse (substance and alcohol dependence/abuse).

3.2. Analytical Approach

Analyses followed four main steps. First, the best-fitting unconditional growth model was established to examine the developmental trajectory of young children's self-regulation. The latent growth modeling (LGM) was utilized, as an approach to capture information about interindividual differences in intraindividual change over time (MacCallum & Austin, 2000; Nesselroade, 1991). LGM is a type of Structural Equation Modeling (SEM). SEM assumes multivariate normality and is a maximum likelihood estimation procedure that simultaneously combines factor analyses and multiple regression path analyses. Models were estimated using Full Information Maximum Likelihood (FIML) in Mplus 7 (Muthen & Muthen, 2015). FIML utilizes all the

information of the observed data including information about the mean and variance of missing portions of a variable based on the observed portions of other variables in the covariance matrix. FIML has greater statistical efficiency when computing standard errors compared to mean-imputation, listwise, or pairwise deletion methods (McDonald & Ho, 2002).

LGM calculates a slope and change and its corresponding intercept for every subject for each variable and correlate those intercepts and slopes of change. The intercept is the value of the growth curve (slope of change) at the first assessment point. From the established unconditional growth model, core parameters (i.e., intercept and linear growth slope) were obtained as indicators for children's self-regulation development and were utilized as dependent variables in the following analyses.

Second, general linear models (GLM) were utilized to examine G2 mothers' and fathers' lifetime psychopathology' impact on children's self-regulation development (Figure 2, line c).

Third, mediation models examining mother-child and father-child parental behaviors as the mechanism for linking G2 mental illness and G3 self-regulation development.

Finally, to explore the effects of G2 psychopathology on G3 self-regulation development in the context of G1 mental illness histories, general linear models were run to examine the interaction between G1 and G2 psychopathology in predicting G3 self-regulation development.

CHAPTER III. RESULTS

1. Descriptive Statistics

1.1. Demographics

At IDS Wave 1 assessment, mother's mean age was 26.14 (SD=2.39), father's mean age was 27.93 (SD=3.28). 24.1% of mothers and 34.7% of fathers reported their highest degree as 12th Grade, 65.1% of mothers and 44.9% of fathers completed some or all four years of college, and 6.6% of mothers and 9.3% of fathers obtained a graduate degree. In terms of annual household income, 3.7% of the families earned less than $5,000, .6% earned $5,000-$9,999, 7.3% earned $10,000-$14,999, 6.1% earned $15,000-$19,999, 19.5% earned $20,000-$29,999, 25.6% earned $30,000-$39,999, 11.0% earned $40,000-$49,999, and 26.2% earned $50,000 or more. At IDS Wave 1 assessment, 15 (9.1%) mothers and 9 (6.0%) fathers reported that they had never married, 136 (91.3%) mothers and 142 (86.1%) fathers were married, and 4 (2.7%) mothers and 8 (4.8%) fathers were separated or divorced.

Among G1 grandparent participants, at the FH assessment period, the mean ages for maternal grandmother, maternal grandfather, paternal grandmother, and paternal grandfather were 50.85 (SD=5.40), 52.39 (SD=5.62), 51.24 (SD=4.94), and 55.05 (SD=6.33), respectively.

1.2. Descriptive Statistics

Table 2 and 3 reported the frequency and descriptive statistics, respectively, of variables included in the analyses. For continuous variables that were not normally distributed (|skewness| > 3, Kurtosis > 8), a winsorizing approach was used to adjust to

normal distribution. Winsorizing involves data censoring that replaces the values of certain extreme observations in a variable by the nearest unaffected values (Dixon, 1960; Tukey, 1962). For skewed data, the winsorizing approach had been demonstrated to retain the ordinal nature of the data whilst reducing the outlier effects (Dixon, 1980). In the negatively skewed G2 mother and father interaction variables, scores of the bottom 5^{th} percentile were identified and replaced by the nearest unaffected values. Adjusted descriptive statistics for these variables were shown in parenthesis. The winsorized variables replaced the original variables and were utilized in all subsequent analyses.

Table 2. Frequencies of G1 Grandparents and G2 Parents Lifetime Psychopathology

	Yes	No	Missing	Total
G2 mother				
Internalizing disorder	87 (50.0%)	78 (44.8%)	9 (5.2%)	174
Externalizing disorder	54 (31.0%)	111 (63.8%)	9 (5.2%)	174
G2 father				
Internalizing disorder	43 (24.7%)	107 (61.5%)	24 (13.8%)	174
Externalizing disorder	79 (45.4%)	71 (40.8%)	24 (13.8%)	174
G1 maternal grandmother				
Internalizing disorder	86 (49.4%)	67 (38.5%)	21 (12.1%)	174
Externalizing disorder	37 (21.3%)	116 (66.7%)	21 (12.1%)	174
G1 maternal grandfather				
Internalizing disorder	44 (25.3%)	107 (61.5%)	23 (13.2%)	174
Externalizing disorder	72 (41.4%)	79 (45.4%)	23 (13.2%)	174
G1 paternal grandmother				
Internalizing disorder	44 (25.3%)	83 (47.7%)	47 (27.0%)	174
Externalizing disorder	21 (12.1%)	106 (60.9%)	47 (27.0%)	174
G1 parental grandfather				
Internalizing disorder	36 (20.7%)	87 (50%)	51 (29.3%)	174
Externalizing disorder	58 (33.3%)	65 (37.4)	51 (29.3%)	174

Table 3. Descriptive Statistics of G3 Children's Self-Regulation

	N	Mean	SD	Skewness	Kurtosis	Scale Range
W1 IBQ duration of orienting	148/174	4.00	.88	.115	-.390	1-7
W2 IBQ duration of orienting	147/174	3.74	.84	.433	.721	1-7
W3 IBQ duration of orienting	138/174	3.52	.83	.379	.016	1-7
W4 TBAQ interest/persistence	103/174	4.25	.62	.227	.632	1-7
Mother						
Positive Expressions	151/174	3.93	.75	-.55	.34	1-5
Negative Expressions	151/174	4.87 (4.89)	.37 (.32)	-3.04 (-2.48)	9.24 (4.19)	1-5
Sensitivity	151/174	4.11	.63	-.25	.11	1-5
Warmth	151/174	4.03	.70	-.27	-.23	1-5
Flatness of affect	151/174	4.80 (4.81)	.50 (.47)	-2.86 (-2.48)	8.99 (5.56)	1-5
Disengagement	151/174	4.68	.61	-1.71	1.75	1-5
Intrusiveness	151/174	4.87 (4.90)	.42 (.30)	-4.04 (-2.71)	18.98 (5.39)	1-5
Father						
Positive Expressions	130/174	3.83	.79	-.170	-.49	1-5
Negative Expressions	130/174	4.87 (4.89)[1]	.40 (.31)	-3.24 (-2.56)	10.37 (4.63)	1-5
Sensitivity	130/174	3.92	.55	-.04	.30	1-5
Warmth	130/174	3.90	.69	-.29	.14	1-5
Flatness of affect	130/174	4.57	.81	-1.94	2.99	1-5
Disengagement	130/174	4.55	.68	-1.24	.21	1-5
Intrusiveness	130/174	4.87 (4.91)	.46 (.29)	-4.01 (-2/85)	17.47 (6.22)	1-5

[1]Descriptive statistics after winsorizing were shown in parentheses.

Interrelations were run among the G3 children's self-regulation outcomes and important demographic characteristics including parents' age, education level, and household income. Interrelation results are presented as Pearson's correlation coefficient in Table 4. The correlation results indicated that children's self-regulation scores at four assessment waves were significantly associated with each other (*p*s<.01). Both mother's and father's education level were also significantly negatively associated with offspring's duration of orienting measures at 3-, 6-, and 12-months.

1.3. Missing Data

Missing data for key independent and dependent measures (i.e., G2 mother and father lifetime internalizing and externalizing disorder, G3 self-regulation scores at waves 1 through 4) were analyzed.

Little's Missing Completely At Random (MCAR) test (Little, 1988) in the SPSS 24 Missing Value Analysis module was utilized to analyze missing data patterns for the key continuous measures (G3 self-regulation scores at waves 1 through 4) in the sample. MCAR test results revealed that all variables were missing completely at random ($\chi^2(23)=28.66$, $p=.19$), indicating that there were no systematic patterns in the missing values. Data that are missing completely at random suggested that the probability that the tested observation is missing is unrelated to the value of the said observation or to the value of any other variables (Howell, 2009).

For categorical variables (i.e., G2 mother and father lifetime internalizing and externalizing disorder), a dummy code "missingness" for each variable was created, with participants with missing data were coded as 0 and those with complete data as 1. Using

Table 4. Interrelations: Demographic Variables and G3 SR Measures at Each Time Point

	1	2	3	4	5	6	7	8	9	10
1 W1 IBQ duration of orienting	1									
2 W2 IBQ duration of orienting	.474**	1								
3 W3 IBQ duration of orienting	.442**	.537**	1							
4 W4 TBAQ interest persistence	.270**	.340**	.505**	1						
5 Mother's age	-.075	-.026	-.142	-.063	1					
6 Mother's education level	-.198*	-.172*	-.276**	-.131	.285**	1				
7 Father's age	.032	.030	-.120	.029	.278**	.070	1			
8 Father's education level	-.211**	-.212*	-.203*	-.027	.205*	.509**	.043	1		
9 Total household income	.010	-.054	-.058	.046	.247**	.298**	.358**	.231**	1	
10 Child Gender	-.12	-.20*	-.22*	-.24*	.04	.15	-.03	.04	.04	1

IBQ = Infant Behavior Questionnaire; TBAQ = Toddler Behavior Assessment Questionnaire
*p<.05; **p<.01; ***p<.001

the “missingness” variable as the grouping variable, indepdennt sample t-tests on G3 self-regulation outcomes were then performed to examine the statistical differences between missing and complete data. The independent sample t-test results revealed that there were no significant differences between the two groups of missing and complete for G2 mother’s internalizing disorder, mother’s externalizing disorder, father’s internalizing disorder, and father’s externalizing disorder (*p*s>.05). In other words, G2 mother and father lifetime internalizing and externalizing disorder variables were all missing completely at random.

In summary, the key variables – G2 mother and father lifetime psychopathology and G3 self-regulation outcomes – were all missing completely at random. Therefore, all variables were directly applied into all subsequent analyses, with Full Information Maximum Likelihood (FIML) estimation approach to impute missing data points

2. Latent Growth Model

To examine the growth trajectory of young children’s self-regulation development across 3-, 6-, 12-, and 24-months, a latent growth model (LGM) was computed. The LGM was an approach to capture information about interindividual differences in intraindividual change over time (MacCallum & Austin, 2000; Nesselroade, 1991). Model fit was assessed based on a number of model fit indices. Kline (2005) suggested the minimum reporting of the following model fit indices: the model chi-square, the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). The model chi-square value is a traditional measure for evaluating overall model fit and assesses the magnitude of

discrepancy between the observed covariance structure and the theoretical covariance structure (Hu & Bentler, 1998, 1999). A non-significant difference ($p > .05$) indicates a good model fit (Kline, 2005). The CFI is a revised form of the Normed-Fit Index (NFI), which assesses the specified model by comparing the chi-square value of the model to the chi-square value of the null model, taking into consideration of sample size (Bentler & Bonett, 1980; Byrne, 1998). The RMSEA indicates the extent to which the specified model with optimally chosen parameter estimates would fit the population covariance matrix (Byrne, 1998; Steiger, 1990). A general consensus established that CFI values greater than .95 and RMSEA values close to or below .06 indicate very good model fit (Hu & Bentler, 1999). Finally, the SRMR is the standardized square root of the difference between the residuals of the sample covariance matrix and the hypothesized covariance model (Kline, 2005). The SRMR ranges from zero to 1.0 with good fitting models obtaining values less than .05 (Bryne, 1998).

An unconditional latent growth model was computed with children's self-regulation represented by the developmentally appropriate scales – i.e., the IBQ duration of orienting scale at 3-, 6-, and 12-months and then by TBAQ interest/persistence scale at 24-months. Both infants' duration of orienting and interest/persistence scales were theorized to be the manifestations of young children's self-regulation (Goldsmith, 1996). In the measures, the TBAQ interest/persistence scale was created with the IBQ duration of orienting scale as a model, and had shown significant interrelation with the duration of orienting scale (interrelation statistics shown in Table 4). Therefore, from a longitudinal perspective, infants' duration of orienting and interest/persistence were treated as the longitudinal representation for children's self-regulation in the current dissertation. An

average score between G2 mother' and G2 father's reporting on the IBQ and TBAQ at each time point was created for each G3 child. The IBQ duration of orienting and the TBAQ interest/persistence scales were then converted into the same scale for further analyses.

The initial unconditional growth model specifying intercept and linear slope demonstrated poor fit ($\chi^2(9)=84.32$, $p<.001$, CFI=.32, RMSEA=.32, SRMR=.22). Constraining the means/intercepts of Wave 1 and Wave 3 IBQ duration of orienting to 0, as suggested by modification indices, significantly improved the model fit: the revised unconditional growth model specifying intercept and linear slope demonstrated good model fit ($\chi^2(11)=2.87$, $p=.41$, CFI=1.00, RMSEA=.00, SRMR=.06). Unconditional growth model specifying intercept, linear slope, and quadratic slope does not converge, indicating a lack of quadratic pattern of the growth trajectory. Therefore, the revised unconditional growth model specifying intercept and linear slope was taken as the final latent growth model. Results of this final model were shown in Figure 4 in the form of standardized beta path coefficients. The model computed the latent variables intercept (i) and linear slope (s) for the self-regulation growth curve (Figure 5). Statistics on intercept and linear slope were presented in Table 4.

Across the four assessment periods, the latent growth model results demonstrated an overall linear increase of children's self-regulation. At the initial assessment, children's self-regulation was significantly different from zero ($\beta=3.66$, $p<.001$) and showed significant individual differences ($\beta=.43$, $p<.001$). Across the assessment period from waves 1 to 4, the linear growth slope was also significantly different from zero ($\beta=.03$, $p<.001$) and showing significant individual differences ($\beta=4.24$, $p<.01$). The observed

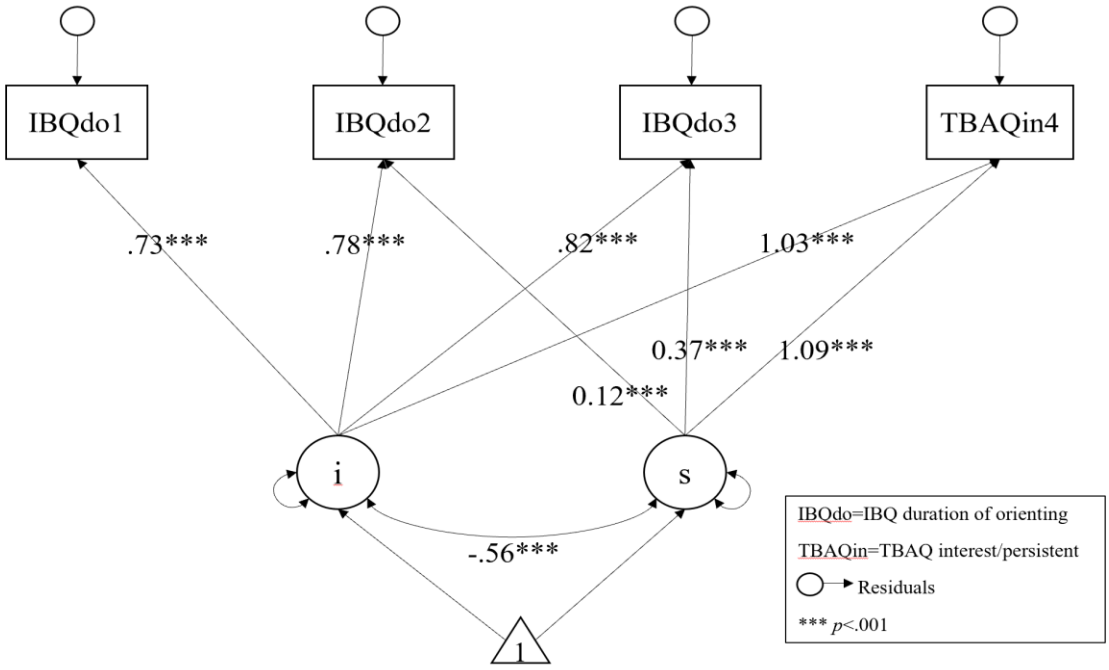

Figure 4. Unconditional Growth Model for Children's Self-Regulation Development

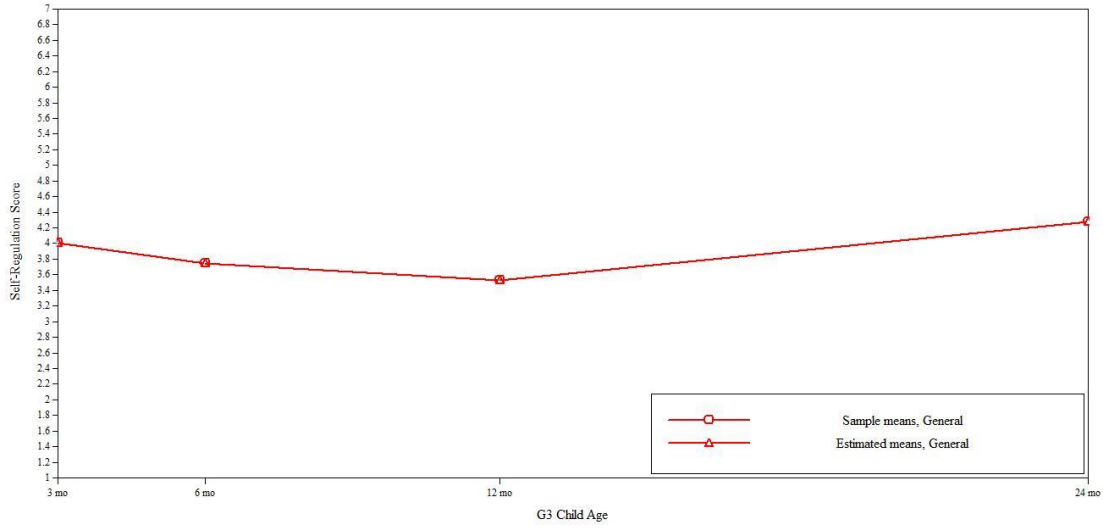

Figure 5. Unconditional Growth Curve for Children's Self-Regulation Development

Table 5. Self-Regulation Growth Curve Intercept and Linear Slope

	Estimate	Standard Error
Mean		
Intercept	3.66***	.08
Slope	.03***	.004
Variance		
Intercept	.43***	.07
Slope	.001**	.00

**p<0.01; ***p<.001

individual values were graphed in Figure 6. In addition, children who were rated as higher on the self-regulation measure at 3-month demonstrated slower self-regulation growth rate into 24-month (β=-.56, p<.001). From the LGM, the latent variables of intercept and linear slope were saved and entered as dependent variables representing children's self-regulation developmental trajectory in all subsequent analyses, with the intercept being interpreted as the intercept of the trajectory (hereinafter as *intercept*, and linear slope as the growth rate of the trajectory (hereinafter as *growth rate*).

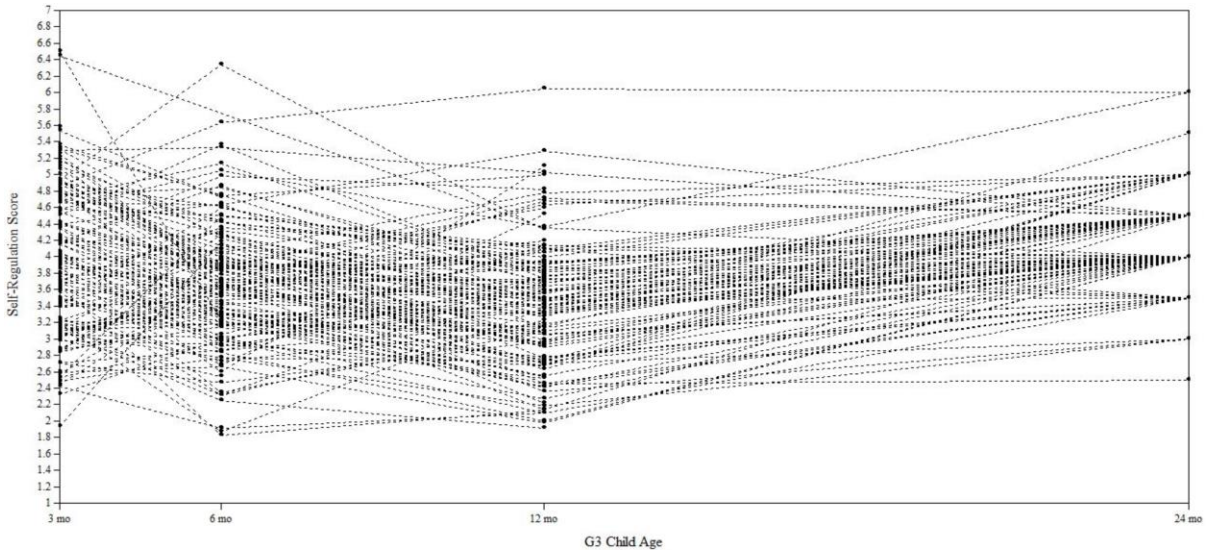

Figure 6. Individual Differences of Self-Regulation Development

An additional post-hoc unconditional latent growth model was run with the self-regulation measures (i.e., duration of orienting) at Waves 1, 2, and 3, given the visually decreasing trend shown in Figure 5. The model specifying intercept and linear slope

demonstrated good model fit ($\chi^2(8)=2.46$, $p=.12$, CFI=.98, RMSEA=.09, SRMR=.03). In other words, from ages 3-, 6-, to 12-month, the growth model results demonstrated an overall linear decrease of children's duration of orienting. Consistent with the previous model, at the initial assessment, children's duration of orienting was significantly different from zero ($\beta=3.96$, $p<.001$) and showed significant individual differences ($\beta=3.38$, $p<.001$). Across the first three waves of assessment, the linear growth slope was also significantly different from zero ($\beta=-.05$, $p<.001$) but did not show significant individual differences ($\beta=.003$, $p=.40$), indicating that all children were decreasing in their duration of orienting across 3-, 6-, and 12-month in similar rates.

Table 6. Interrelations: Demographic Variables and G3 SR Growth

	1	2	3	4	5	6	7	8
1 SR intercept	1							
2 SR slope	-.486**	1						
3 Mother's age	-.076	.017	1					
4 Mother's education level	-.253**	.132	.285**	1				
5 Father's age	-.003	.026	.278**	.070	1			
6 Father's education level	-.258**	.177*	.205*	.509**	.043	1		
7 Total household income	-.040	.083	.247**	.298**	.358**	.231**	1	
8 Child Gender	-.21**	-.02	.04	.15	-.03	.04	.04	1

*$p<.05$; ***$p<.01$; ***$p<.001$

Interrelations were run among the latent growth variables (intercept and linear slope) and key G2 parents' demographic characteristics: mothers' and fathers' age, mothers' and fathers' education level, household income, and child gender. Interrelation results were presented in Pearson's correlation coefficient in Table 6. Both parents' education level was significantly negatively associated with offspring's self-regulation intercept ($r=-.49$,

p<.01). Father's education level was positively associated with offspring's self-regulation development slope (r=.18, p<.05), such that the higher educational degree fathers had obtained, the faster their offspring's self-regulation increases. Children's gender was significantly associated with their self-regulation intercept (r=-.21, p<.01) but not the growth rate (r=-.02, p=.80). In other words, at 3-months, boys were rated at a significantly lower score on self-regulation measure than girls, but boys and girls then demonstrated similar rates of self-regulation development into 24-months.

Although it was a common approach to statistically control for relevant variables by including them in the primary analyses (Neter, Kutner, Nachtsheim, & Wasserman, 1996), other researchers have criticized this approach. Specifically, by statistically controlling variables that were not conceptually hypothesized, Becker (2005) argued that this approach produces incorrect inferences. Similarly, Spector, Zapf, Chen, and Frese (2000) argued that statistical control of variables, in fact, partial out the true variance from the hypotheses of interest, which in turn increase Type II errors. Type I error may also increase as the control variables may associate with the main predictors by chance. For the above reasons and also to preserve statistical power, variables tested in the interrelation analyses were not included in any of the subsequent analyses.

3. General Linear Models

Multivariate analysis of variance (MANOVA), a type of general linear model (GLM), was utilized to examine the predictive effects from G2 parents' lifetime psychopathology on their offspring's self-regulation development.

One MANOVA model was run, entering self-regulation growth' intercept and slope as dependent variables, and G2 mother' and father's internalizing and externalizing disorder dichotomous variables, as well as all the two-way interactions, as independent variables. Overall model was significant for intercept ($F(4)=2.77$, $p<.05$) and slope ($F(4)=2.47$, $p<.05$). Results were shown in Table 7.

Table 7. G2 Psychopathology and G3 Self-Regulation Development

	DV: Intercept	DV: Slope
G2 mother internalizing disorder	2.23	.49
G2 mother externalizing disorder	1.48	.28
G2 father internalizing disorder	1.16	4.79*
G2 father externalizing disorder	1.03	.67
G2m_int*G2m_ext	4.68*	.80
G2m_int*G2f_int	.52	1.11
G2m_int*G2f_ext	.23	.01
G2m_ext*G2f_int	.02	.23
G2m_ext*G2f_ext	.02	.00
G2f_int*G2f_ext	.04	.06

G2m_int=G2 mother internalizing disorder; G2m_ext=G2 mother externalizing disorder; G2f_int=G2 father internalizing disorder; G2f_ext=G2 father externalizing disorder
*$p<.05$

As shown in the results, mothers' internalizing, externalizing disorders and father's externalizing disorders do not predict children's self-regulation growth across 3- to 24-months (ps>.05). However, children with fathers experiencing internalizing disorders anytime in their lifetime presented with a significantly faster self-regulation development in the first two years of life ($F(1)=4.79$, $p<0.5$), comparing to those with fathers without lifetime internalizing disorders, independent of mothers' psychopathology influences.

In addition, the interaction between G2 mother's internalizing and externalizing disorders was significant in predicting G3 children's self-regulation intercept ($F(1)=4.68$, $p<.05$). This interaction effect was further probed and presented in Figure 7. As shown in Figure 7, for children with mothers did not experience externalizing disorders anytime in their life, whether or not their mothers have experienced internalizing disorders did not predict children's self-regulation intercept (simple slope=.03, $t(149)=.28$, $p=.78$). On the other hand, for children with mothers who have experienced externalizing disorders anytime in their life, children of mothers who also experienced internalizing disorders were demonstrated significantly higher self-regulation intercept than those with mothers without internalizing disorders (simple slope=.38, $t(149)=2.36$, $p<.05$).

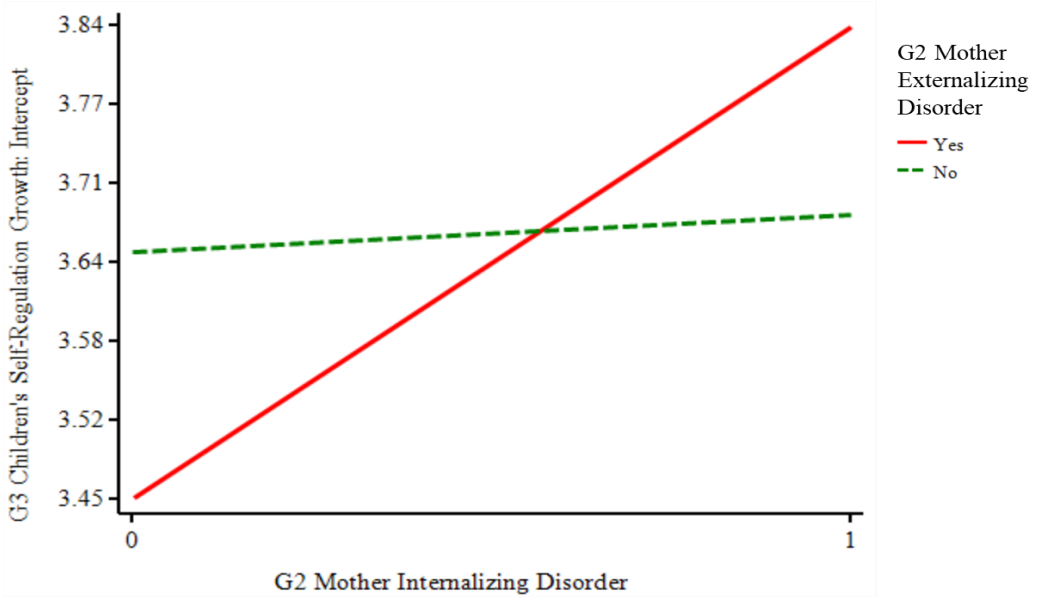

Figure 7. The Interaction between G2 Mothers' Internalizing and G2 Mothers' Externalizing Disorder in Predicting G3 Children's Self-Regulation Intercept

4. Mediation Models

It was hypothesized that parents' lifetime psychopathology predicted their offspring's self-regulation developmental trajectory through parental behaviors toward their children

(i.e., mediation model, Figure 8). However, as revealed in previous analysis step (Table 7), the main effect between G2 parents' lifetime psychopathology and G3 children's self-regulation development was only established for G2 father's lifetime externalizing disorder and G2 children's self-regulation slope. Mediation models examining the mediating role of father's parental behaviors toward their children were run. Figure 2 displayed the proposed mediation model; the direct association between G2 father's lifetime externalizing disorder and G3 children's self-regulation growth slope was represented as path c, and association between G2 father's lifetime externalizing disorder and father's parental behaviors as path a. Association between parental behaviors and G3 children's self-regulation growth slope, taking into consideration of G2 father's lifetime externalizing disorder, as path b. Finally, association between G2 father's lifetime externalizing disorder and G3 children's self-regulation growth slope, taking into consideration of father's parental behaviors, was represented as path c'. The results, presented in unstandardized correlation or regression coefficients for each path, were presented in Table 8.

Overall, the results suggested that fathers' parental behaviors did not mediate the prediction between fathers' lifetime externalizing disorder and their children's self-regulation slope.

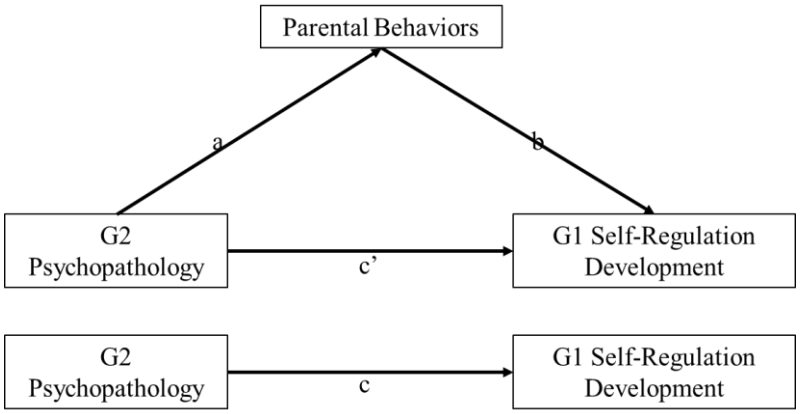

Figure 8. Examining Parental Behaviors as the Mechanism for Linking G2 Psychopathology and G1 Self-Regulation Development

Table 8. Mediation Model Results

	c path (*F*)	a path (*r*)	b path (Std. *β*)	c' path (Std. *β*)
G2 Father's Internalizing Disorder (DV: G3 Self-Regulation Development Slope)				
Positive Affect	4.79*	.08	-.05	-.20*
Negative Affect	4.79*	.01	-.004	-.20*
Sensitivity	4.79*	.09	-.04	-.20*
Warmth	4.79*	.03	.04	-.20*
Flatness of Affect	4.79*	-.04	.01	-.20*
Disengagement	4.79*	.20	.05	-.20*
Intrusiveness	4.79*	.17*	-.05	-.19*

*p<.05

5. Moderation Models

As revealed above, mediation models did not explain the mechanisms of parental behaviors in linking G2 parents' lifetime psychopathology and G3 children's self-regulation growth, given (a) the lack of direct paths between G2 mothers' internalizing, externalizing, father's internalizing disorder and children's self-regulation growth, as well as (b) the lack of mediation effects for the association between G2 father's externalizing disorder and children's self-regulation growth through fathers' parental

behaviors. To explore the role of parental behaviors as a potential mechanism in the association between G2 parents' psychopathology and G3 children's self-regulation development, subsequently, moderation models were run (Figure 9). All continuous variables were centered before entering the interaction. Moderation model results were presented in Table 9 and 10, with the unstandardized regression coefficients being reported.

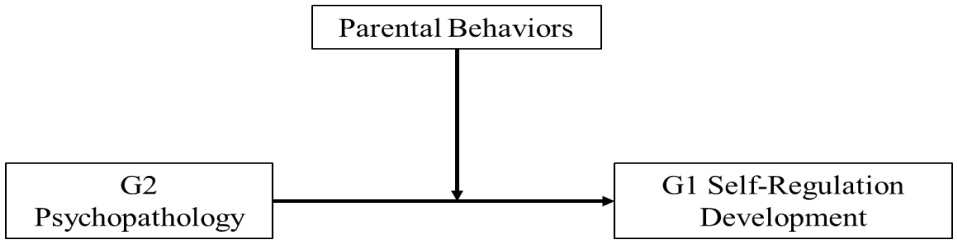

Figure 9. Moderation Model

First, examining the interactional effects between G2 mother's lifetime internalizing disorder and mothers' parental behaviors in predicting G3 children's self-regulation development, moderation model results demonstrated that there were no significant main effects nor interaction effects between mothers' lifetime internalizing disorders and mothers' negative affect, sensitivity, warmth, flatness of affect, disengagement, and intrusiveness in predicting G3 children's self-regulation intercept (*p*s>.05). There were also no significant main effects nor interaction effects between mothers' lifetime internalizing disorders and mothers' positive negative affect, sensitivity, flatness of affect, disengagement, and intrusiveness in predicting G3 children's self-regulation growth (*p*s>.05). Rather, results revealed significant main effects and interaction effects between G2 mother's internalizing disorder with positive affect in predicting children's self-regulation intercept and mother's internalizing disorder with warmth in predicting self-regulation growth rate.

Table 9. Moderation Model: G2 Mother – G3 Self-Regulation Development

	DV: Intercept							DV: Slope						
	PA	NA	SS	WM	FA	DE	IN	PA	NA	SS	WM	FA	DE	IN
G2m_int	1.33**	-1.56	.64	.81	1.25	-.12	.63	-.03	.08	-.01	-.06*	-.04	-.01	.00
Parental Behavior	.26*	-.16	.07	.12	.22	-.16	.00	-.01	.01	.00	-.01$^{\#}$	-.01	.00	.01
Interaction	-.31*	.34	-.13	-.17	-.23	.05	-.10	.01	-.02	.00	.01*	.01	.00	-.00
G2m_ext	-.12	-.18	.71	-.68	.18	-.18	.29	.04	.03	-.01	.02	-.00	-.04	.03
Parental Behavior	.10	-.02	.05	-.00	.05	-.15	.03	-.00	.00	.00	.00	.00	.00	.00
Interaction	.03	.04	-.17	.17	-.04	.04	-.06	-.01	-.01	.00	-.00	.00	.01	-.01

PA=Positive Affect; NA=Negative Affect; SS=Sensitivity; WM=Warmth; FA=Flatness of Affect; DE=Disengagement; IN=Intrusiveness
G2m_int=G2 mother's lifetime internalizing disorder; G2m_ext=G2 mother's lifetime externalizing
$^{\#}p<.10$; *$p<.05$; **$p<.01$

Interaction between G2 mother's internalizing disorder with positive affect in predicting children's self-regulation intercept was further probed (Figure 10). The significant main effect of mother's psychopathology suggested that children with mothers who have experienced internalizing disorders in their lifetime demonstrated significantly higher self-regulation intercept than those with mothers without lifetime internalizing disorder (β=1.33, p<.01). The significant main effect of mothers' positive affect suggested a significant positive association between mothers' expressions of positivity when interacting with their children and their children's self-regulation intercept (β=.26, p<.05). Further, as shown in Figure 10, for mothers who did not experience internalizing disorder in their lifetime, their positive affect during interaction positively associates with children's self-regulation intercept (simple slope=.26, t(137)=3.05, p<.05). For those who experienced internalizing disorders anytime in their lifetime, there were no differences on children's self-regulation intercept with changes in mothers' positive affect during mother-child play (simple slope-.04, t(137)=-.52, p=.61).

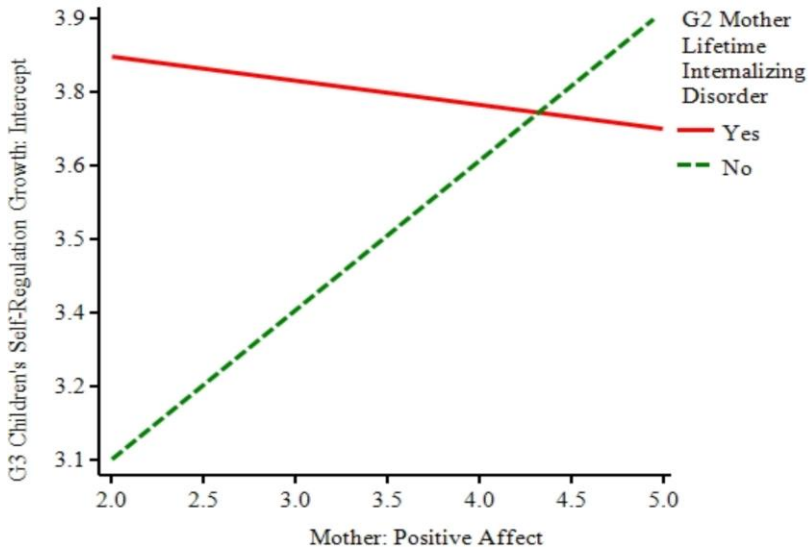

Figure 10. Mothers' Internalizing Disorder and Mothers' Positive Affect Associate with Children's Self-Regulation Intercept

Interactional effects between mother's internalizing disorder and warmth in predicting self-regulation growth rate was further probed (Figure 11). The model results suggested that, overall, children with mothers who have experienced internalizing disorders in their lifetime demonstrated significantly slower self-regulation growth rate than those with mothers who have not experienced internalizing disorders (β=-.06, p<.05). Mothers' warmth during mother-child interaction tended to negatively predict children's self-regulation growth rate (β=-.01, p=.08). As shown in Figure 11, for mothers who have experienced internalizing disorder in their lifetime, their warm affection during play significantly predicted the rate of their children's self-regulation growth rate (simple slope=-.01, t(137)=-1.75, p<.05). Whereas for mothers who did not experience internalizing disorders, their warmth was not predictive of children's self-regulation growth rate (simple slope=.01, t(137)=1.51, p=.13).

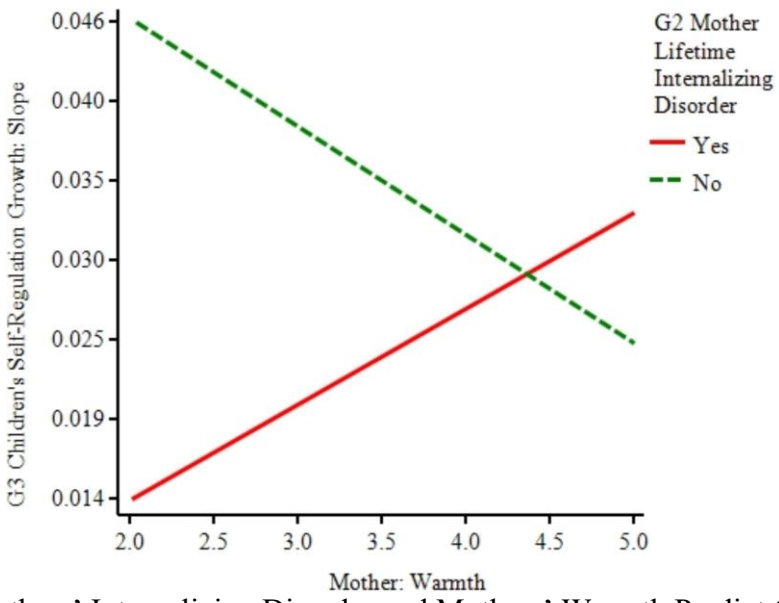

Figure 11. Mothers' Internalizing Disorder and Mothers' Warmth Predict Children's Self-Regulation Growth Rate

Second, examining the interactional effects between G2 mother's lifetime externalizing disorder and mothers' parental behaviors in predicting G3 children's self-regulation development (intercept and growth rate), moderation model results did not demonstrate any main effects by mothers' lifetime psychopathology or mothers' parental behaviors during mother-child interaction, nor did the models reveal any significant interactions between mothers' lifetime externalizing disorders and parental behaviors in predicting children's self-regulation development.

Third, as shown in Table 10, examining the interactional effects between G2 fathers' lifetime internalizing disorder and fathers' parental behaviors in predicting G3 children's self-regulation development (intercept and growth rate), moderation models did not reveal any significant main or interactional effects of fathers' lifetime internalizing disorder and parental behaviors during father-child interaction in predicting children's self-regulation intercept. On the other hand, in predicting the rate of children's self-regulation growth rate, although there were no significant main or interactional effects between fathers' internalizing disorder and fathers' negative affect, warmth, flatness of affect, disengagement and intrusiveness, the models revealed significant international effects between fathers' internalizing disorder and fathers' positive affect and sensitivity.

Interactional effects between fathers' internalizing disorder and positive affect in predicting self-regulation growth rate was further probed (Figure 12). The model results suggested a significant main effect by fathers' internalizing disorder, such that, overall, children with fathers who have experienced internalizing disorders in their lifetime demonstrated a faster self-regulation growth rate from 3- to 24-month of age (β=.05, p<.05). There was no significant main effect of fathers' positive affect in predicting

Table 10. Moderation Model: G2 Father – G3 Self-Regulation Development

	DV: Intercept							DV: Slope						
	PA	NA	SS	WM	FA	DE	IN	PA	NA	SS	WM	FA	DE	IN
G2f_int	-.29	1.04	-.86	.07	.04	.13	.80	.05*	-.01	.06	.02	.01	.01	-.01
Parental Behavior	-.00	.04	-.06	.02	-.06	-.11	.12	.00	-.00	.00	.00	.00	.00	-.01
Interaction	.11	-.18	.26	-.04	.02	.00	-.13	-.01*	-.00	-.02*	-.01	-.01	-.01	-.00
G2f_ext	.80#	.16	.40	1.19*	2.77**	.67	-.29	-.01	-.01	.03	-.03	-.06*	.03	-.03
Parental Behavior	.10	-.10	-.01	.07	.09	-.08	-.11	-.00	-.00	.00	-.00	-.01	.01	-.01
Interaction	-.14	-.03	-.03	-.23#	-.26*	-.08	.12	-.00	-.00	-.01	.00	.01*	-.01	.00

PA=Positive Affect; NA=Negative Affect; SS=Sensitivity; WM=Warmth; FA=Flatness of Affect; DE=Disengagement; IN=Intrusiveness
G2f_int=G2 father's lifetime internalizing disorder; G2f_ext=G2 father's lifetime externalizing
#p<.10; *p<.05; **p<.01

children's self-regulation growth rate (β=.00, p=.20). As shown in Figure 12, for fathers who have experienced internalizing disorders in their lifetime, their more expression of positivity during father-child play predicted their children's slower self-regulation growth rate from 3- to 24-month (simple slope=-.01, t(124)=-2.30, p<.05). For fathers who have never experienced internalizing disorders, their positive affect did not predict their children's self-regulation growth rate (simple slope=.00, t(124)=1.28, p=.20).

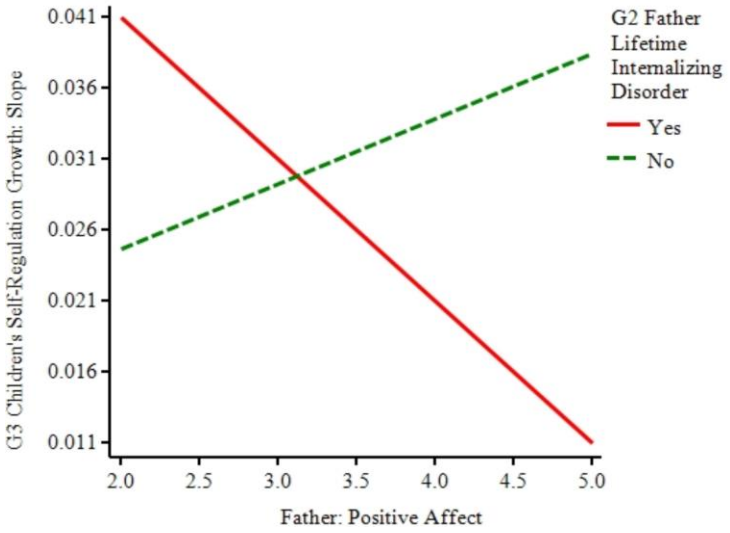

Figure 12. Fathers' Internalizing Disorder and Fathers' Positive Affect Predict Children's Self-Regulation Growth Rate

Interactional effects between fathers' internalizing disorder and sensitivity in predicting self-regulation growth rate was further probed (Figure 13). The model results did not reveal any main effects by fathers' lifetime internalizing disorder (β=.06, p=.11) or fathers' sensitivity (β=.00, p=.77). Nevertheless, the interaction between the two independent variables was significant in predicting children's self-regulation growth rate. Specifically, as shown in Figure 13, for fathers who have never experienced internalizing

disorders in their lifetime, their sensitivity during father-child play did not predict their children's self-regulation growth rate (simple slope=.01, $t(124)=.30$, $p=.77$). However, for those who have experienced internalizing disorders anytime in their lifetime, the more sensitivity they demonstrated during father-child play, the slower their children's self-regulation develops (simple slope=-.02, $t(124)=-2.17$, $p<.05$).

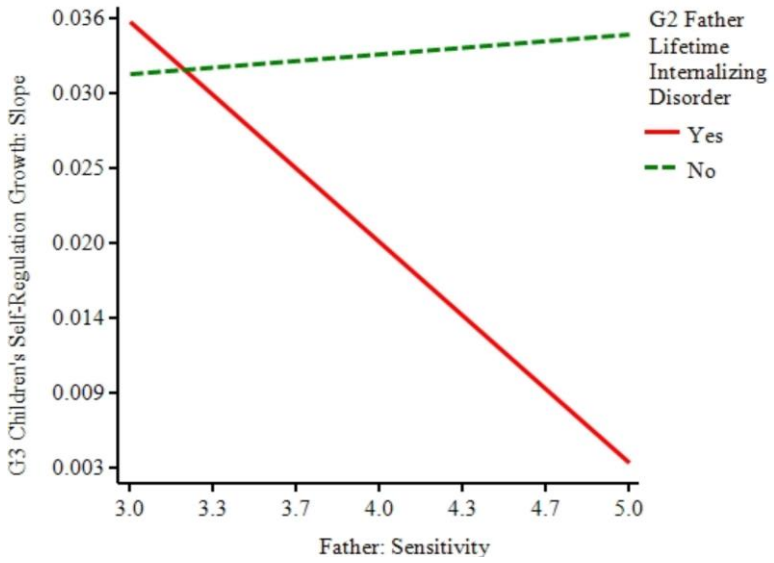

Figure 13. Fathers' Internalizing Disorder and Fathers' Sensitivity Predict Children's Self-Regulation Growth Rate

Finally, moderation models were run to examine the interactional effects between G2 fathers' lifetime externalizing disorder and fathers' parental behaviors in predicting G3 children's self-regulation development (intercept and growth rate). In predicting children's self-regulation at 3-month, moderation analyses did not reveal any significant interactional effects between fathers' lifetime externalizing disorder and fathers' positive affect, negative affect, sensitivity, disengagement, and intrusiveness. Nevertheless, interactional effects were shown by fathers' externalizing disorder and fathers' warmth and flatness of affect. Similarly, in predicting children's self-regulation growth rate, only

fathers' externalizing disorder and fathers' flatness of affect demonstrated a significant interactional effect.

Interactional effect between fathers' externalizing disorder and warmth in predicting self-regulation intercept was further probed (Figure 14). The model results suggested a significant main effect by fathers' externalizing disorder, such that, children with fathers who have experienced internalizing disorders in their lifetime demonstrated significant higher self-regulation intercept (β=1.19, p<.05). There was no significant main effect of fathers' positive affect in predicting children's self-regulation intercept (β=.07, p=.48). As shown in Figure 14, for fathers who have not experienced any externalizing disorders in their lifetime, their warmth during father-child interaction was not associated with children's self-regulation intercept (simple slope=-.07, t(124)=.71, p=.48). On the other hand, for fathers who have experienced externalizing disorders in their lifetime, their higher level of warmth during father-child play predicted their children's self-regulation intercept (simple slope=-.16, t(124)=.1.77, p<.05).

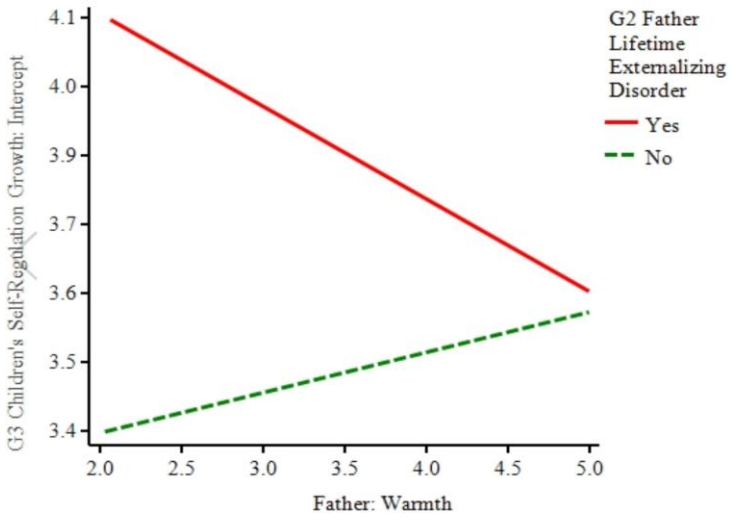

Figure 14. Fathers' Externalizing Disorder and Fathers' Warmth Associate with Children's Self-Regulation Intercept

Interactional effect between fathers' externalizing disorder and flatness of affect in predicting self-regulation intercept was further probed (Figure 15). The model results suggested a significant main effect by fathers' externalizing disorder, such that, children with fathers who have experienced internalizing disorders in their lifetime demonstrated significant higher self-regulation intercept (β=2.77, p<.01). There was no significant main effect of fathers' positive affect in predicting children's self-regulation intercept (β=.09, p=.31). As shown in Figure 15, for fathers who have not experienced any externalizing disorders in their lifetime, their warmth during father-child interaction was not associated with children's self-regulation intercept (simple slope=.09, t(124)=1.02, p=.31). On the other hand, for fathers who have experienced externalizing disorders in their lifetime, their higher level of warmth during father-child play predicted their children's self-regulation intercept (simple slope=-.17, t(124)=-2.23, p<.05).

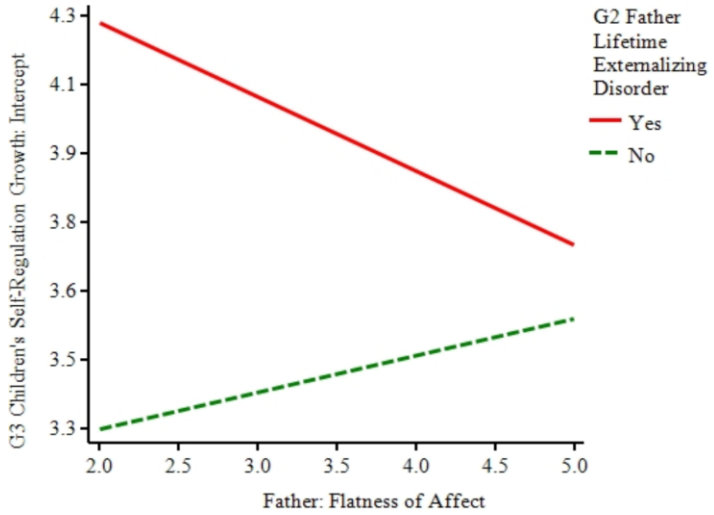

Figure 15. Fathers' Externalizing Disorder and Fathers' Flatness of Affect Associate with Children's Self-Regulation Intercept

Interactional effect between fathers' externalizing disorder and flatness of affect in predicting self-regulation growth rate was further probed (Figure 16). The model results suggested a significant main effect by fathers' externalizing disorder, such that, children

with fathers who have experienced internalizing disorders in their lifetime demonstrated significantly slower self-regulation growth rate between 3- to 24-month (β=-.06, p<.05). There was no significant main effect of fathers' positive affect in predicting children's self-regulation growth rate (β=-.01, p=.19). As shown in Figure 16, for fathers who have not experienced externalizing disorders, the more flatness of affect they showed during father-child interaction, the slower their children's self-regulation develops (simple slope=-.01, t(124)=-1.31, p=.19); whereas the association was the opposite for fathers who have experienced externalizing disorder anytime in their life (simple slope=.01, t(124)=1.44, p=.15). Of note, neither of the two simple slopes reached statistical significance; nevertheless, the significant interaction effect as indicated in the regression model suggests that the directionality of the prediction from fathers' flatness of affect during father-child play activity to children's self-regulation growth rate was significantly different for fathers who have experienced and those who have not experienced externalizing disorders in their lifetime.

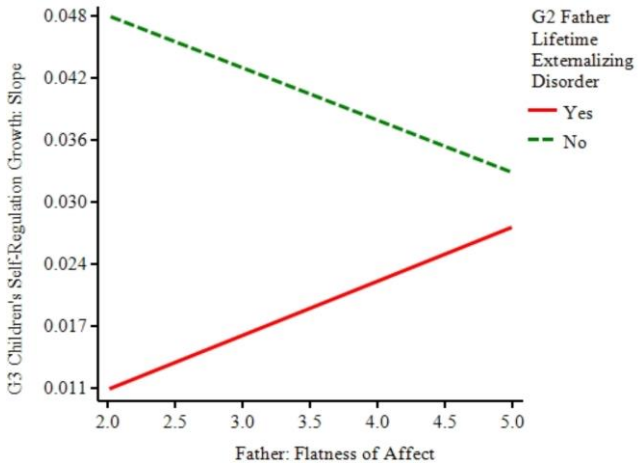

Figure 16. Fathers' Externalizing Disorder and Fathers' Flatness of Affect Predict Children's Self-Regulation Growth Rate

6. G1 Psychopathology

6.1. Missing Data in G1 Psychopathology

The missing data pattern in each G1 psychopathology variable was examined. For each categorical variable (i.e., G1 grandparents' lifetime internalizing and externalizing disorder), a dummy code "missingness" for each variable was created, with participants with missing data were coded as 0 and those with complete data as 1. Using the "missingness" variable as the grouping variable, independent sample t-tests on G3 self-regulation outcomes were then performed to examine the statistical differences between missing and complete data. The independent sample t-test results revealed that there were no significant differences between the two groups of missing and complete for all G1 grandparents' lifetime psychopathology. In other words, G1 grandparents' lifetime internalizing and externalizing disorder variables were all missing completely at random. Therefore, all variables were directly applied into all subsequent analyses, with Full Information Maximum Likelihood (FIML) estimation approach to impute missing data points.

6.2. Association between G1-G2 Psychopathology

The association between G1-G2 lifetime psychopathology was first analyzed. Given the dichotomous nature of all psychopathology variables (0=absence of psychopathology; 1=presence of psychopathology), chi-square analyses were run. Results of all G1-G2 lifetime psychopathology association were presented in Table 11, in the form of phi (*f*) statistics. The phi statistics represents the correlation between two dichotomous variables, equivalent of the *r* statistics for continuous variables (Lee Rodgers & Nicewander, 1988).

Table 11. Association between G1-G2 Lifetime Psychopathology

Maternal Side	1	2	3	4	5	6
1 G2m_int	1					
2 G2m_ext	.06	1				
3 G1m_m_int	.15# .08	-.05	1			
4 G1m_m_ext	.06	.07	.25	1		
5 G1m_f_int	-.01	.01	.20*	.11	1	
6 G1m_f_ext	.15# .06	.15# .07	.01	.19*	.32***	1
Paternal Side	7	8	9	10	11	12
7 G2f_int	1					
8 G2f_ext	.16*	1				
9 G1f_m_int	.04	-.04	1			
10 G1f_m_ext	.10	.04	.21*	1		
11 G1f_f_int	.02	.01	.23*	.06	1	
12 G1f_f_ext	-.08	.21	.13	.03	.22*	1

G2m_int=G2 mothers' internalizing disorder; G2m_ext=G2 mothers' externalizing disorder; G2f_int=G2 fathers' internalizing disorder; G2f_ext=G2 fathers' externalizing disorder;
G1m_m_int=G1 maternal grandmother's internalizing disorder; G1m_m_ext=G1 maternal grandmother's externalizing disorder; G1m_f_int=G1 maternal grandfather's internalizing disorder; G1m_f_ext=G1 maternal grandfather's externalizing disorder; G1f_m_int=G1 paternal grandmother's internalizing disorder; G1f_m_ext=G1 paternal grandmother's externalizing disorder; G1f_f_int=G1 paternal grandfather's internalizing disorder; G1f_f_ext=G1 paternal grandfather's externalizing disorder;
#p<.10; *p<.05; **p<.01; ***p<.001

As shown in Table 11, the results demonstrated some evidence for an association between G1-G2 psychopathology on mothers' sides, but not for the fathers' sides. Specifically, both G1 maternal grandmothers' lifetime internalizing (f=.15, p=.08) and externalizing disorders (f=.15, p=.06) approached the traditional criteria for statistical significance in terms of their association with G2 mothers' internalizing disorders. Also,

the association between G1 maternal grandmothers' lifetime externalizing disorder and G2 mothers' externalizing disorder approached statistical significance. (f=.15, p=.07).

In terms of comorbidity, the internalizing and externalizing disorders were significantly associated with each other for G1 maternal grandfathers (f=.32, p<.001), G1 paternal grandmothers (f=.21, p<.05), and G1 paternal grandfathers (f=.22, p<.05).

Interestingly, some evidence for the association between couples' lifetime psychopathology emerged. Namely, for maternal grandparents, maternal grandmothers and maternal grandfathers' psychopathology were significantly associated with both internalizing disorder (f=.20, p<.05) and externalizing disorder (f=.19, p<.05). For paternal grandparents, paternal grandmothers' internalizing disorder and paternal grandfathers' internalizing disorder were significantly associated with each other (f=.23, p<.05).

6.3. General Linear Models

Multivariate analysis of variance (MANOVA) was again utilized to examine the predictive effects from G1 grandparents' lifetime psychopathology on G3 children's self-regulation development.

First, two sets of MANOVA models were run, one for maternal grandparents' internalizing and externalizing disorders predicting G3 children's self-regulation development (intercept and growth rate), and one for paternal grandparents' influences. In each MANOVA model, the main effects of each grandparent's internalizing and externalizing disorder were entered as independent variables, and G3 children's self-

regulation intercept and slope were entered as dependent variables. Results were shown in Table 12 and 13.

As shown in Table 12 and 13, none of the presence of maternal grandparents' lifetime internalizing or externalizing disorder predict G3 children's self-regulation development. On the paternal side, the presence of paternal grandmother's internalizing disorder predicts a higher slope (i.e., faster developmental rate) of G3 children's self-regulation.

Table 12. Maternal Side: G1 Maternal Grandparents' Psychopathology and G3 Self-Regulation Development

	DV: Intercept	DV: Slope
Maternal grandmother internalizing disorder	2.13	1.81
Maternal grandmother externalizing disorder	.16	.60
Maternal grandfather internalizing disorder	.00	1.56
Maternal grandfather externalizing disorder	.84	.02

Table 13. Paternal Side: G1 Maternal Grandparents' Psychopathology and G3 Self-Regulation Development

	DV: Intercept	DV: Slope
Paternal grandmother internalizing disorder	.27	4.04*
Paternal grandmother externalizing disorder	.70	.03
Paternal grandfather internalizing disorder	1.20	.20
Paternal grandfather externalizing disorder	.47	.73

*$p<.05$

Having established a baseline model for understanding the G1-G3 cross-generational influence from G1 lifetime psychopathology to G3 early self-regulation development, the next step of analysis concerns the impact of G2 psychopathology on G3 self-regulation development in the context of G1 psychopathology. Again, two sets of MANOVA

models were run, one for each G2 side of the family. In each MANOVA model, the main effects of G1 and G2 grandparents' internalizing and externalizing disorders were entered, along with the interaction between G1 and G2 psychopathology. Consistent with all previous models, G3 children's self-regulation developmental trajectory's intercept and slope were entered as dependent variables. The model results were presented in Table 14 and 15.

As shown in Table 14, when considering the effects of G1 and G2 psychopathology from the maternal side of the family on G3 self-regulation development, only maternal grandmother's internalizing disorder demonstrated a trending predictive effect on children's self-regulation intercept ($F(1)=3.16$, $p=.08$) and also on the growth rate ($F(1)=2.79$, $p=.09$). Specifically, comparing to children with maternal grandmothers who have never experienced any internalizing disorders in their lives, those with maternal grandmothers with an internalizing disorder demonstrated higher reported self-regulation intercept and a slower developmental growth rate.

Table 14. Maternal Side: The Interaction between G1 and G2 Psychopathology and G3 Self-Regulation Development

		DV: Intercept	DV: Slope
G1	G1m_m_int	3.16#	2.79#
	G1m_m_ext	.14	.36
	G1m_f_int	.01	1.13
	G1m_f_ext	1.24	.05
G2	G2m_int	.03	.16
	G2m_ext	.01	.08
G1 x G2	G2m_int x G1m_m_int	.36	2.21
	G2m_int x G1m_m_ext	.00	.04
	G2m_int x G1m_f_int	.87	.07
	G2m_int x G1m_f_ext	1.46	.82
	G2m_ext x G1m_m_int	1.78	1.96
	G2m_ext x G1m_m_ext	.80	.16
	G2m_ext x G1m_f_int	.02	.06
	G2m_ext x G1m_f_ext	.12	1.46

G1m_m_int=G1 maternal grandmother's internalizing disorder; G1m_m_ext=G1 maternal grandmother's externalizing disorder; G1m_f_int=G1 maternal grandfather's internalizing disorder; G1m_f_ext=G1 maternal grandfather's externalizing disorder; G2m_int=G2 mothers' internalizing disorder; G2m_ext=G2 mothers' externalizing disorder; # $p<.10$

As shown in Table 15, when considering the effects of G1 and G2 psychopathology from the paternal side of the family on G3 self-regulation development, none of the G1 and G2 lifetime internalizing and externalizing disorder showed significant main effects in predicting G3 self-regulation intercept or its growth rate. However, certain G1 and G2 lifetime psychopathology demonstrated interactional effects, indicating a cross-generational effect in the context of other family lifetime psychopathology. The significant and trending significant interaction effects were further probed below.

Table 15. Paternal Side: The Interaction between G1 and G2 Psychopathology and G3 Self-Regulation Development

		DV: Intercept	DV: Slope
G1	G1f_m_int	.28	2.26
	G1f_m_ext	.64	.34
	G1f_f_int	1.72	.16
	G1f_f_ext	.00	.99
G2	G2f_int	.71	1.47
	G2f_ext	2.23	1.77
G1 x G2	G2f_int x G1f_m_int	.01	.01
	G2f_int x G1f_m_ext	.00	.39
	G2f_int x G1f_f_int	.60	.09
	G2f_int x G1f_f_ext	.02	.13
	G2f_ext x G1f_m_int	3.15#	.07
	G2f_ext x G1f_m_ext	.01	.02
	G2f_ext x G1f_f_int	7.06**	.52
	G2f_ext x G1f_f_ext	.87	3.26#

G1f_m_int=G1 paternal grandmother's internalizing disorder; G1f_m_ext=G1 paternal grandmother's externalizing disorder; G1f_f_int=G1 paternal grandfather's internalizing disorder; G1f_f_ext=G1 paternal grandfather's externalizing disorder; G2f_int=G2 fathers' internalizing disorder; G2f_ext=G2 fathers' externalizing disorder; #$p<.10$; **$p<.01$

The interaction between G1 paternal grandmother's internalizing disorder and G2 father's externalizing disorder in predicting children's self-regulation intercept was probed and shown in Figure 17. For children with paternal grandmothers who never experienced internalizing disorders, the presence of their fathers' externalizing disorder is significantly associated with a higher self-regulation intercept (simple slope=.30, $t(120)=2.54$, $p<.05$). On the other hand, if children's paternal grandmother experienced an internalizing disorder in their lifetime, fathers' externalizing disorder no longer associates with children's self-regulation intercept (simple slope=.05, $t(120)=.32$, $p=.75$).

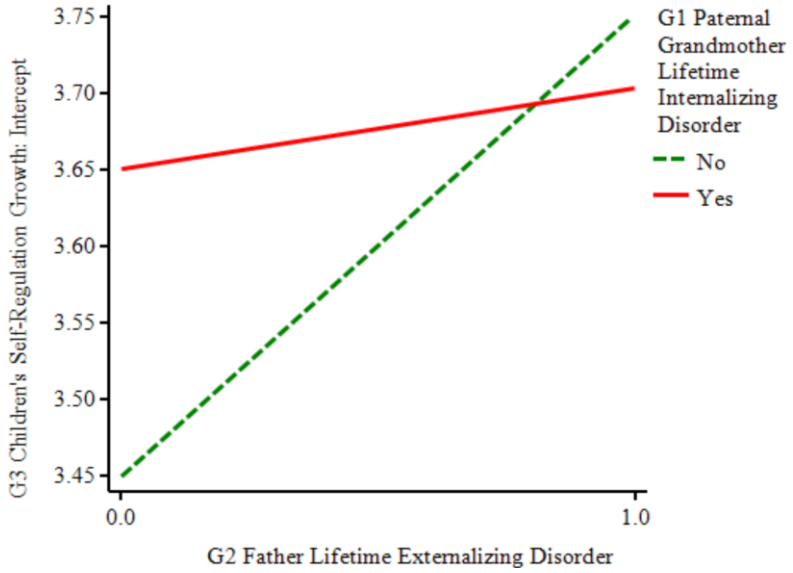

Figure 17. G1 Paternal Grandmothers' Internalizing Disorder and G2 Fathers' Externalizing Disorder Predict G3 Children's Self-Regulation Intercept

The interaction between G1 paternal grandfather's internalizing disorder and G2 father's externalizing disorder in predicting children's self-regulation intercept was probed and shown in Figure 18. For children with paternal grandfather who experienced internalizing disorders in their life, the presence of their father's externalizing disorder significantly associates with a higher self-regulation intercept (simple slope=.49,

t(117)=2.79, *p*<.01). On the other hand, if children's paternal grandfather did not experience any internalizing disorders in their lifetime, fathers' externalizing disorder does not associate with children's self-regulation intercept (simple slope=.09, *t*(117)=.77, *p*=.44).

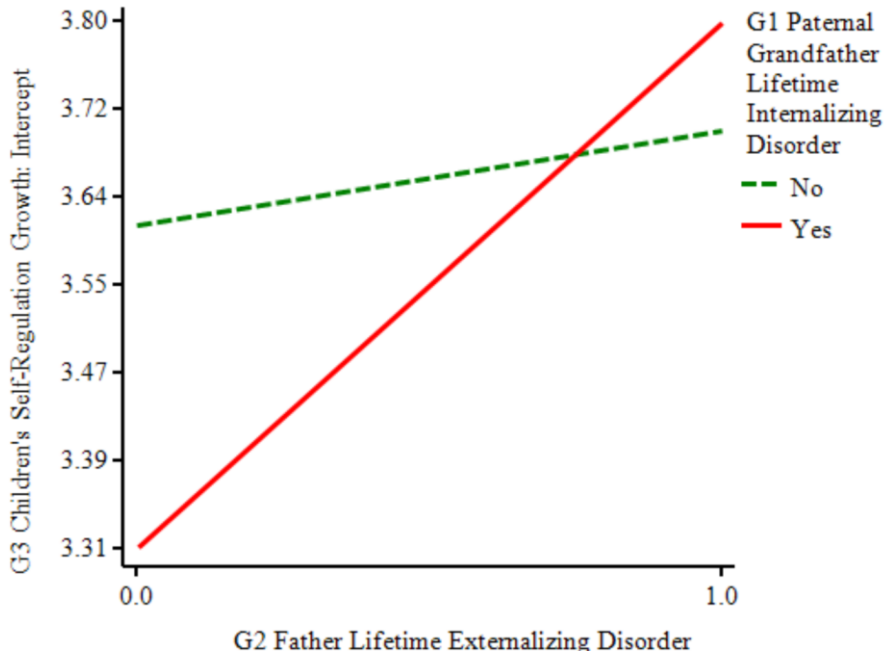

Figure 18. G1 Paternal Grandfathers' Internalizing Disorder and G2 Fathers' Externalizing Disorder Predict G3 Children's Self-Regulation Intercept

Finally, the interaction between G1 paternal grandfather's externalizing disorder and G2 father's externalizing disorder in predicting children's self-regulation growth rate was probed and shown in Figure 19. For children with paternal grandfathers who did not experience any externalizing disorders in their lifetime, the presence of their father's externalizing disorder significantly predicts a slower self-regulation growth rate (simple slope=-.02, *t*(117)=-2.82, *p*<.01). On the other hand, for children with paternal grandfathers who experienced externalizing disorders in their lifetime, their fathers'

externalizing disorders no longer predicts self-regulation growth rate from 3- to 24-months (simple slope=.00, $t(117)=.23$, $p=.81$).

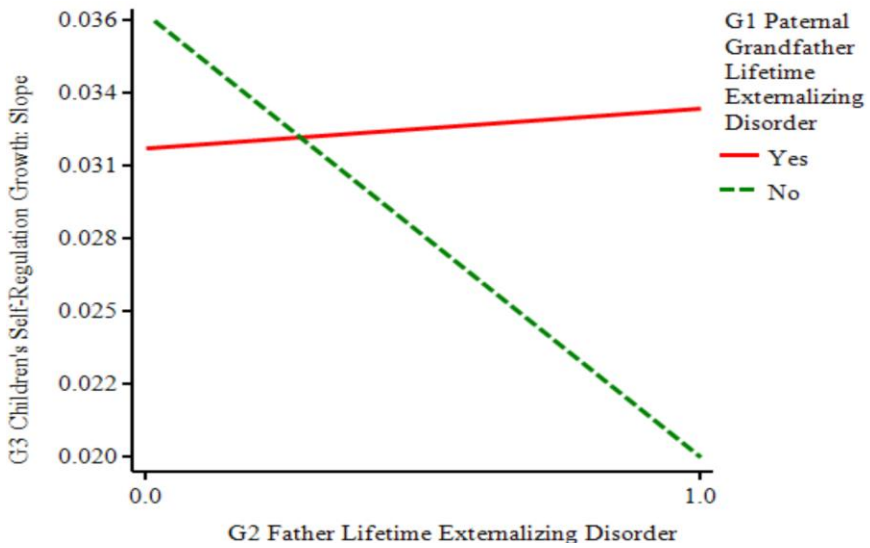

Figure 19. G1 Paternal Grandfathers' Externalizing Disorder and G2 Fathers' Externalizing Disorder Predict G3 Children's Self-Regulation Growth Rate

CHAPTER IV. DISCUSSION

The current dissertation aimed to examine the development of infant self-regulation in the first two years of life within the context of family history of mental illness. Operationalizing infants' self-regulation by a parent reported measure of behavioral orientation, the results revealed that infants demonstrated an overall increasing regulatory capacity from 3- to 24-months, with some evidence of a short-term decrease from 3- to 12-months. Children in the current sample showed significant individual differences in both their self-regulation intercept (i.e., the intercept) as well as the growth rate (i.e., the slope). Further, those who were rated as on higher self-regulation intercept subsequently experienced a slower growth rate of self-regulation development. Although neither maternal lifetime internalizing or externalizing disorder, nor paternal externalizing disorder, significantly predicted children's self-regulation development, the presence of fathers' lifetime internalizing disorder was associated with children's faster self-regulation growth rate from 3- to 24-months. With regard to the transmission between parental history of mental illness and the development of children's self-regulation, certain parental behaviors demonstrated significant moderating effects. These parental behaviors included both positive behaviors such as positive affect, warmth, and sensitivity, as well as negative or the lack of positive behaviors, such as parents' flatness of affect during play. Finally, the three-generation analysis results provided additional evidence on intergenerational transmission of psychopathology (i.e., G1-G2 psychopathology). Importantly, these results revealed that lifetime psychopathology in G1 maternal grandmothers was associated with their grandchildren's self-regulation, and lifetime psychopathology in G1 paternal grandparents demonstrated moderating effects

on the association between G2 fathers' psychopathology and G3 children's self-regulatory development.

1. Self-Regulation Development from 3- to 24-months

1.1. Establishing the Trajectory of Self-Regulation Development from 3- to 24-months

The first research question concerns the development of young children's self-regulation from 3- to 24-months. As hypothesized, young children demonstrated an overall increase in their self-regulation scores from 3- to 24-months, with significant individual differences in both the self-regulation intercept as well as the rate of its development. However, a closer examination on the course of children's self-regulation development in the first year revealed a significant decrease in infants' self-regulation scores from 3- to 12-months. Considering the current dissertation's operationalization of self-regulation in infancy by the duration of behavioral orientation towards one object/event/activity, in other words, the current results revealed that parents' report of children's duration of orientation decreased significantly from 3- to 12-months, and then underwent a significant increase from 12- to 24-months. Although this was a surprising finding, the decreasing and increasing periods of duration of orientation may require differential interpretations given the unique developmental stages, each of which may be consistent with previous literature.

First, although empirical studies that examine children's regulatory capacity in the first year of life are lacking, Posner and Rothbart (1998, 2000) theorized that infants exhibit very little regulatory control in their first year of life. At this stage, infants were

mainly passively reacting to environmental and internal stimuli (i.e., reactivity or involuntary control). Namely, approach (orienting towards) reactivity was observed to be associated with presentation of low-intensity stimuli, while withdrawal (orienting away) was associated with high intensity stimuli (McGuire & Turkewitz, 1979).

It has also been well-established in the literature that the second half of first year is a key stage for self-regulation development. Neurologically, researchers have pointed out the attentional processes underlying regulatory capacity, which associates with a number of brain regions including the anterior cingulate cortex (ACC) and the lateral prefrontal areas, which are together termed the executive attention network (Rothbart & Rueda, 2005). In the second half of an infants' first year, neuroimaging studies with young children have provided evidence that executive attention undergoes rapid maturation. Subsequently, with the enhanced executive attention skills, children's self-regulatory capacity during the second half of first year also undergoes significant enhancement (Bridgett, Gartstein, et al., 2009). This is also reflected in behaviors, through their orienting capacity, where it has been observed that infants start to actively apply their own regulation strategies to their reactivity, especially during toddlerhood. At this stage, infants are improving their voluntary control of their orientation based on environmental and internal stimuli, such that their orientation may be initiated (e.g., in the visual domain, by looking towards), enhanced (e.g., looking intently), maintained (e.g., extended orienting), reduced (e.g., gaze aversion), or terminated (e.g., looking away; Posner & Rothbart, 1981; Rothbart & Derryberry, 1981; Rothbart, 1989b). In other words, in the current dissertation, the duration of orientation measured during the first year, especially at 3- and 6-months, is likely mainly representing infants' *involuntary*

reactivity rather than *voluntary* regulation. Consistent with Bridget, Gartstein, and colleague's (2009) review, the decrease in the reactivity in the first year represents the transition that the reactive nature of infants' attentional and regulatory processes is transforming to involve greater voluntary attentional and regulatory control.

Subsequently, the duration of orientation measured at 24-months is theorized to measure children's duration of task engagement in ongoing solitary play or other activities (termed interest/persistence; Goldsmith, 1996). In other words, at this stage, young children's behavioral orientation reflects their voluntary control of their behaviors and task engagement. Such extended task engagement in toddlerhood has been suggested to be robustly associated with later self-regulatory capacity (Bell, Calkins, & Posner, 2012; Goldsmith, 1996; Johansson, Marciszko, Gredeback, Nystrom, & Bohlin, 2015; Ruff & Capozzoli, 2003). As shown in the current dissertation, moving beyond the first year of life, young children demonstrated a significant increase of duration of orientation from 12- to 24-months. This trajectory is consistent with the developmental trajectory of self-regulation established in the literature. Most empirical research on self-regulation development has focused on the middle to late childhood periods and has consistently observed a pattern of continuously increasing regulatory control across this period of life (e.g., Deater-Deckard, 2014; Lengua, 2006). Nevertheless, for young children, emerging findings has been consistent with Posner and Rothbart's (1981) theory reviewed above. For example, studying toddlers at ages 22- and 33-months, Kochanska, Murray, and Harlan (2000) concluded significant increase in children's regulatory control. Similarly, Willoughby, Wirth, and Blair (2012) observed continued rapid development of young children's self-regulation into 5-years of age. In my earlier work examining children's

effortful control from age 1- to 9-years, the results also indicated the most rapid increase in effortful control capacities in the first four and half years, with a subsequent slower but still moderately increasing rate into 9-years of age (Sun, Berkman, DeGarmo, & Essex, manuscript in preparation).

Overall, the current results provide robust evidence that children demonstrated increased regulatory capacity in the first two years of life. Taking a closer look at the results, the current dissertation suggests that, when interacting with an environmental stimulus, infants first demonstrated a decrease in their involuntary reactivity from 3- to 12-months, and subsequently demonstrated a strong increase in their voluntary control from 12- to 24-months. Nevertheless, given the differential interpretation of infants' duration of orientation during different developmental periods, it may not be accurate to continue interpreting both stages of orientation as reflecting children's regulation capacities. Rather, the categorization of children's behavioral orientation should be based on the corresponding developmental stage. In the following discussion, I will refer the duration of orientation in the first year of life as *reactivity*, and duration of orientation (i.e., interest/persistence as termed in TBAQ, Goldsmith, 1996) at 24-months as *regulation.*

1.2. Individual Differences in the Trajectory of Self-Regulatory Development

Following the establishment of the developmental trajectory of self-regulation from 3- to 24-months, subsequent results suggested that children with higher self-regulation intercept demonstrated a flatter self-regulation development trajectory into 24-months. This result accords with previous findings by Bridgett, Gartstein and colleagues (2009).

Also utilizing latent growth modeling techniques, Bridgett and colleagues studied infants' negative emotionality, another reactivity measure, and regulatory capacity from 4- to 12-months of age. They concluded that high negative emotions compromise the development of infants' regulation. On the other hand, specifically studying visual attention measures (fixation duration and variation in fixation duration) in 10-month old infants, Geeraerts, Tynjala, & Heikkinen (2018) reached somewhat different conclusions. They found that infants' longer fixations and less variation in fixation duration predicted better effortful control at 30-months. These mixed findings on the association between early reactivity and later regulatory outcomes were indeed proposed by some early theories. Specifically, researchers speculated that too much or too little reactivity can both affect the development of regulation (Hill-Soderlund & Braungart-Rieker, 2008; Rothbart & Bates, 2006; Stifter & Spinrad, 2002). Nevertheless, several important points need to be taken into consideration when interpreting the discrepancy between the findings in the current dissertation and the extant literature. First, the duration of orientation construct measured in the current dissertation includes, but is not limited to, the visual domain of orientation (i.e., fixation). Other aspects of behavioral orientation were incorporated as well, such as object and task engagement. In other words, it is possible that behavioral orientation at different modalities reflect differential mechanisms and therefore have differential predictive power with respect to regulatory outcomes. It is also important to distinguish the dependent variable of cross-sectional measures of self-regulation constructs and the development, or the *growth,* of self-regulation. With limited available literature, it is not yet clear what the most preferable and/or adaptive directionality of self-regulation growth rate might be. Nevertheless, the two concepts – the level of self-regulation at certain

developmental stage and the rate of development – should not necessarily be taken as reflecting the same underlying processes.

Significant individual differences in the self-regulation developmental trajectories were also observed in the current sample. This is consistent with both previous theory and empirical evidence. As Rothbart and Derryberry (1981) theorized, children's regulatory capacity, as one of the temperament constructs, has a constitutional basis. In other words, self-regulation reflects a relatively enduring biologically-based aspect of the individual, which is also influenced over time by heredity, maturation, and experience. Later empirical studies have also demonstrated such individual differences when studying young children's self-regulation at cross-sectional early developmental stages (e.g., Calkins, Howse, & Philippot, 2004; Johansson et al., 2015; Weinberg, Tronick, Cohn, & Olson, 1999) as well as its developmental trajectory during infancy and toddlerhood (Bridget, Gartstein, et al., 2009; Hendry, Jones, & Charman, 2016; Kochanska et al., 2000). Within such individual differences, subsequent research has addressed the precursors and predictors of adaptive or maladaptive self-regulation development.

In the current dissertation, our findings indicated certain important demographic variables in predicting individual differences in young children's self-regulation. Namely, although parental age and household income were not associated with children's reactivity intercept, infants do tend to demonstrate higher self-regulation intercept if their parents are at higher education level and if the infants are girls. This is consistent with previous findings that have suggested that low SES as a risk factor for children's poor self-regulation outcomes (Jansen, Raat, et al., 2008). On the other hand, in terms of self-regulation development, only father's education level predicted faster self-regulation

development. The rate of self-regulation development did not differ with regard to mother's education level, either parents' age, or household income. In addition, this developmental rate appears to be comparable in boys and girls in the current sample. Recent literature studying the stability of temperament reported similar findings. Assessing infants at 2-, 5-, and 13-months of age, Bornstein, Putnick, Gartstein, Hahn, Auestad and O'Conner (2015) found that temperamental reactivity is stable and robust from 2- to 13-months of age across gender and socioeconomic status.

With such individual differences in early self-regulation development being identified, researchers have subsequently explored the predictors and precursors of these differences. A considerable amount of these research studies adopted an ecological perspective (Bronfenbrenner, 1979), which takes into consideration of multiple levels of external factors' cumulative impact on children's developmental outcomes. Within this perspective, the role of parental psychopathology and parental behaviors are studied in the current dissertation, the results of which are discussed below.

2. G2 Psychopathology and G3 Self-Regulation Development

2.1. G2 Maternal and Paternal Lifetime Internalizing and Externalizing Disorders and G3 Self-Regulation Development

The current dissertation concerned early self-regulation development in the context of family history of mental illness. Specifically, I examined to association between both parents' lifetime internalizing and externalizing disorders and the child's development of self-regulation. As reviewed in Chapter 1, the categorization of internalizing and externalizing disorders is based on the rationale that certain disorders share common

feature of affective or behavioral dysregulation, respectively (Kotov, Krueger, et al., 2017). Compared to focusing on the impact of single disorders, examining groups of disorders with shared symptomotology enables the current project to identify the constructs (i.e., affect and behavioral dysregulation) that are the essential characteristics posing risks for the next generation.

Examining the effects of both parents' psychopathology, the current results revealed differential impacts of fathers and mothers' psychopathology in predicting children's self-regulation development. Namely, mothers' lifetime psychopathology was associated with children's reactivity intercept, whereas fathers' internalizing disorders significantly predicted children's self-regulation growth rate into 24-months. This differential effects from mothers' and fathers' psychopathology are discussed separately below.

First, in terms of mothers' lifetime psychopathology, the current results suggest a comorbidity effect of mothers' psychopathology on children's reactivity intercept. That is, the main effects of maternal lifetime internalizing or externalizing disorders subsumed under their interactional effect – the presence of mothers' lifetime externalizing disorder associates with children's self-regulation intercept, but only when mothers also present with lifetime internalizing disorders. This finding is overall consistent with that being suggested in the literature. Specifically, majority of empirical literature robustly suggested maternal internalizing dysregulation in predicting young infants' difficulties in temperamental reactivity. Studying reactivity in 4- and 6-months infants when reacting to novel stimuli, Mohler, Parzer, Brunner, Wiebel, and Resch (2006) and Suurland, Van der Heijden, Smaling, Huijbregts, van Goozen, and Stephanie (2017) respectively concluded that such infant reactivity is significantly predicted by mothers' prenatal emotional stress.

From a neurological perspective, other studies indirectly suggest similar associations. For instance, Van den Bergh and colleagues (2017) found that mothers' stress dysregulation was significantly correlated with aberrations in a number of aspects of infant neurological developmental, including structural brain connectivity within the prefrontal cortex, a brain region that plays an important role in infants' reactivity and later regulation development. Furthermore, although a limited number of studies have explicitly observed similar associations between mothers' externalizing symptomotology and infants' reactivity, some studies have also reported deleterious effects on infant temperamental characteristics from co-occurring mental health issues from mothers (Edwards & Hans, 2015; Drabick, Gadow, & Sprafkin, 2006).

Conversely, paternal lifetime psychopathology does not appear to associate with children's reactivity intercept. Although emerging literature has started to report an association between fathers' internalizing disorders (e.g., depression) and child internalizing and externalizing symptoms (for a review, Kane & Garber, 2004), few studies have focused on explicit temperamental trait such as reactivity. Further, although a recent research also reported a null association between fathers' internalizing disorders (depression and anxiety) and child reactivity at 9 years (Kujawa, Proudfit, & Klein, 2014), the current dissertation is among the first to explicitly study this association in young infants. Future studies are needed to replicate and extend such findings.

The current results suggest that, instead, fathers' internalizing disorders significantly predict the *growth rate* of self-regulation development. That is, comparing to those with fathers who have never experienced internalizing disorders, children with fathers who experienced internalizing disorders anytime in their lifetime demonstrated faster self-

regulation growth rate (greater slope) from 3- to 24-months. Although some studies have observed associations between fathers' internalizing disorders and children's internalizing and externalizing behavioral outcomes, as reviewed above (Kane & Garber, 2004), the current dissertation is unique in examining such fathers' intergenerational risk transmission for the *growth rate* of child development. With the emergence of more empirical research focusing on the developmental trajectory of self-regulation (e.g., Deater-Deckard, 2014; Lengua, 2006; Partridge & Lerner, 2007), future studies should consider the prospective predictors of individual differences in such trajectory.

Despite the findings discussed above, it is worth noting that the current dissertation did not identify any interactional effects between mothers' and fathers' lifetime psychopathology with respect to predicting the development of infant self-regulation. These results are important to consider, as previous studies have found a high rate of co-existence of psychopathology in couples (e.g., Snyder & Whisman, 2003; Rowe, Doss, Hsueh, Libet, & Mitchell, 2011), which we have also observed in the current dissertation. However, we did not find that couples' co-existing psychopathology predicted offspring self-regulation development (intercept and growth rate). This differs from early theories and empirical evidence that emerged from a cumulative ecological risk model perspective, which suggested greater deleterious effects on child regulatory outcomes when children were exposed to psychopathology in multiple parents (for a review see, Appleyard, Egeland, van Dulmen, & Sroufe, 2004; Evans, Li, & Whipple, 2013). However, many such studies also incorporated other risk factors, such as low SES and child maltreatment, in addition to parental psychopathology. When focusing in on parents' psychopathological symptoms only, more recent studies such as Breaux, Harvey,

and Lugo-Candelas (2014) also observed unique, rather than cumulative effects, between mothers and fathers' symptomotology and children's dysregulation. Specifically, they concluded that mothers' ADHD and fathers' depressive/anxiety symptoms independently predict preschoolers' behavioral dysregulation. Similarly, Paulson and colleagues (2006) found 9-months infants' worse behavioral outcomes when mother *or* father suffers from depression. From this unique finding, Paulson and colleagues subsequently suggested a family compensatory model in which the negative predictive effects were reduced when *both* parents present with depression.

2.2. Parental Behaviors as Potential Mechanism

To further understand the underlying processes by which parental psychopathology transmits its risks into the next generation, the current dissertation also examined parental behaviors as the potential mediator of this relationship. Driven by the robust literature that has found an important role for parental behaviors within the intergenerational transmission of psychopathology (for a review, Goodman, 2015), the current dissertation takes into consideration both preferred (positive affect, warmth, and sensitivity) and non-preferred (negative affect, flatness of affect, disengagement, and intrusiveness) behaviors by mothers and fathers when interacting with their children.

2.2.1. Parental Behaviors as Mediators

Inconsistent with predictions, the current study did not reveal any mediation effects of parental behaviors within the association between parental psychopathology and child self-regulation development (intercept and growth rate). For maternal parental behaviors,

this null finding is surprising, as mothers' warmth, sensitivity, and control behaviors have been well addressed as mediators between mothers' psychopathology and child regulatory outcomes in past studies (Bowers & Yehuda, 2016; Goodman, 2015). There are a few potential explanations for the lack of significant mediational paths in the current study. First, previous literature typically assesses mothers' parental behaviors in two ways. One is through mothers' self-report (e.g., Harold, Rice, Hay, Boivin, Van den Bree, & Thapar, 2011). When assessing parental behaviors, self-reporting methods may offer valuable information not only on observable behaviors but also on parents' internal ideation about interacting with children (Heming, Cowan, & Cowan, 1990), therefore are likely to provide a wholistic view the reflects their day-to-day behaviors with their infants. Another approach is by experimental observations on maternal behaviors during laboratory tasks/situations that are designed to elicit certain emotions such as distress, which create an opportunity to subsequently observe mothers' reactions and strategies in providing care to the infants (e.g., Still-Face Paradigm; Weinberg & Tronick, 1996). Through such an approach, some researchers argue that, compared to mothers' day-to-day parental behaviors under unstressed conditions, their reactions to stressful situations with their infants tend to be the most influential factor for infants' behavioral outcomes (Rodriguez, Ayduk, Aber, Mischel, Sethi, & Shoda, 2005). Compared to these two approaches, the current dissertation measured parental behaviors through global behavioral coding completed by experimenters, which incorporates parents' behaviors towards their children throughout the laboratory visit, including unstructured play time, non-stressful interactions (e.g., free play), positive interactions (e.g., peek-a-boo), as well as stressful interaction (e.g., arm restraint).

On the other hand, with respect to the role of fathers' parental behaviors as potential mediators, the current dissertation did not reveal any significant mediation effects. In contrast to the well-established literature on mothers' behaviors as mediators of the intergeneration transmission of risk for psychopathology, the literature on the role of fathers' behaviors tend to be limited. Nevertheless, significant mediational models in which paternal psychopathology predicts negative outcomes in young children have been reported, with greater father-child negativity (Jacob & Johnson, 1997), decreased emotional availability (Cummings, Keller, & Davies, 2005), and increased intrusiveness and negative discipline (Kashdan, Jacob, Pelham, Lang, Hoza, Blumenthal, & Gnagy, 2004) all showing effects.

2.2.2. Parental Behaviors as Moderators

By contrast to the findings for mediational effects, the current dissertation revealed moderating effects, by which parental behaviors interacted with parental psychopathology in predicting the development of infant self-regulation. Again, the current dissertation suggests unique moderation effects for mothers versus fathers. For mothers, their positive expressions were associated with infants' self-regulation intercept, but only when mothers had not experienced an internalizing disorder. For fathers, both increased warmth and flatness of affect were associated with lower infant self-regulation intercept, but only when fathers had experienced an externalizing disorder. Although such findings are intriguing, they are rather unexpected, as the opposite direction of parental behaviors (warmth versus flatness of affect) appears to associate with same direction of outcome. This may be a result of measurement method, such that the

behavioral coding of fathers' warmth and flatness of affect may not accurately reflect the constructs intended to be measured. As an outcome, such moderation effects are limited in their reliability, and future studies are needed before firm conclusions are drawn.

It is also important to note that these associations between parental behaviors and infant self-regulation intercept need to be interpreted with caution, as the causal direction between parental behaviors (measured at 3-months postnatal lab visit), and infants' self-regulation intercept (closely reflecting reactivity at 3-months), cannot be determined by contemporaneous measurement. This caution on inferring directionality of parental behaviors and child temperamental characteristics is discussed further in the limitation section below.

Moderation effects between parental psychopathology and parental behaviors were also found to predict children's the growth rate of self-regulation from 3- to 24-months. Namely, for mothers, when presenting with no lifetime internalizing disorders, increased maternal warmth predicts slower self-regulation growth rate; whereas when mothers present with any lifetime internalizing disorders, more warmth predicts faster self-regulation growth rate. For fathers, both their higher frequency of positive expressions and sensitivity towards their children predict children's slower self-regulation growth rate from 3- to 24-months, but only when fathers present with lifetime internalizing disorders. Similar to above, the current findings are relatively unique in terms of applying self-regulation trajectory parameters as outcome measures and therefore lack preceding literature for comparison. Future replications of these effects are needed to draw more confirmatory conclusions.

Taken together, the current results imply that, compared to negative maternal behaviors including negative expressions, disengagement, and flatness of affect, mothers' positive expression and warmth are more influential in the context of maternal lifetime internalizing disorders. For fathers, their positive paternal behaviors such as positive affect, warmth, and sensitivity are important for development of children's reactivity and self-regulation in the context of fathers' internalizing disorders, whereas negative paternal behaviors such as flatness of affect are more influential in the context of lifetime externalizing disorders.

3. G3 Self-Regulation Development in the Context of G1 and G2 Psychopathology

3.1. G1-G2-G3 Influences

Finally, the current dissertation explored the influences of family history of mental illness beyond the parent-child generation on the development of children's self-regulation. Overall, the results indicated that G1 lifetime psychopathology demonstrated some predictive effects, although limited, on the growth rate of G3 children's self-regulation development. Specifically, such effects were significant for paternal grandmothers' internalizing disorders, the presence of which predicted faster development of self-regulation amongst G3 children.

Also consistent with the overall literature, the current results suggested interactional effects when taking into consideration the role of both G1 and G2 lifetime psychopathology in predicting G3 child outcomes. That is, the impact of G2 lifetime psychopathology associated with reactivity or predicted self-regulation growth differently in the context of different presentations of G1 lifetime psychopathology.

First, on the maternal family side, maternal grandmothers' lifetime internalizing disorders predicted G3 children's higher self-regulation intercept as well as a slower self-regulation growth rate, above and beyond the influence of any G2 maternal lifetime psychopathology. On the paternal family side, paternal grandparents' lifetime psychopathology showed international effects with G2 paternal psychopathology in predicting G3 child self-regulation development. Specifically, when paternal grandfather presents with lifetime internalizing disorder *or* when paternal grandmother does *not* present with lifetime internalizing disorder, the presence of G2 fathers' lifetime externalizing disorders associates with higher self-regulation intercept. And only when G1 paternal grandfather does not present with lifetime externalizing disorders, the presence of G2 father's lifetime externalizing disorder predicts a slower self-regulation growth rate.

Overall, although studies examining familial transmission of psychopathology risk across three generations have been limited, the above results are consistent with the general proposition in the current literature that risk for psychopathology can be continuous across three generations. For instance, in a large community sample of preschoolers, Cents, Kok, et al. (2014) reported that, independent of G2 psychopathology, G3 lifetime anxiety and depression predicted both internalizing and externalizing problems in their three-year-old grandchildren (G3). Similarly, even after controlling for elevated psychological distress in G2, Hancock et al. (2013) reported that a history of broadly defined nervous and emotional mental health problems in grandparents is associated with elevated emotional and behavioral difficulties. Focusing on major depressive disorder (MDD), both Weissman, Wickramaratne et al. (2005) and

Grillon, Warner, et al. (2005) reported interaction between G1 and G2 MDD in predicting G3 psychopathology.

It is worth noting that, however, the outcome measures in majority of the above mentioned three-generation studies are typically internalizing and externalizing symptoms in early to middle childhood, which have been reliably suggested as predictors of children's later psychopathology (for a review, Cicchetti & Toth, 2014). Nevertheless, utilizing the same dataset as the current dissertation, Olino and colleagues (2008) observed similar G1-G2-G3 cross-generational influences of psychopathology in predicting children's internalizing and externalizing behaviors as early as 24-months. Additional studies corroborating the current results are needed to draw more definitive conclusions regarding how children's emotional and behavioral dysregulation in the early ages might be influenced by family history psychopathology.

3.2. Potential Mechanisms of G1-G2-G3 Transmission of Risks

Some previous literature has offered insights regarding the mechanisms through which G1-G2-G3 cross-generational transmission of risk may occur. Most prominently, similar to what has been reported within the parent-child generation literature, many studies reveal moderate associations between G1-G2 and G2-G3 communication and parenting practices. For instance, as early as in the 1980s, Bowman and Howard (1985) studied a group of Black youth with regard to their ideation on their racial status. The researchers found that 68 percent of Black youth self-reported receiving some messages about their racial status – including the communication on ethnic pride, self-development, racial barrier awareness and egalitarianism – from their parents, just like how these

parents received such communication from their parents (i.e., G1 grandparents). Later literature explicitly studied and concluded modest intergenerational continuity of specific parenting practices such as disciplinary practices (Thornberry, Freeman-Gallant, & Lovegrove, 2009), abusive and harsh parenting (e.g., Cicchetti & Rizley, 1981; Pears & Capaldi, 2001; Simons, Whitbeck, Conger, & Wu, 1991) as well as warmth and sensitive parenting practices (e.g., Belsky, Conger, & Capaldi, 2009; Chen & Kaplan, 2001; Thornberry, Freeman-Gallant, Lizotte, Krohn, & Smith, 2003). Given the robust evidence on parenting practices as robust predictors for child outcomes, these literatures provide prominent rationale for continued transmission of psychopathology beyond G2-G3 generation.

Furthermore, some neurobiological evidence has started to emerge on the impact of risk factors pertaining to family context of psychopathology on infants' brain development, especially as related to the executive function network. With non-human subjects, Banqueri, Mendez, Gomez-Lazaro, and Arias (2019) reported that repeated stress exposure such as separating from mothers in early postnatal life has devastating effects on brain cells, increasing brain inflammation that relates to offspring's later affective disorders such as depression. In another study, Gemmel, Kokras, Dalla, and Pawluski (2018) discovered that mothers' prenatal distress showed enduring effects on offspring's prefrontal cortex synaptic structure. These studies, mostly emerge from epigenetics framework, offer valuable insights on the potential physiological mechanism by which family context of psychopathology passes alone its risk at the neurological level.

3.3. Additional Evidence on Intergenerational Transmission of Psychopathology

In addition to the G1-G2-G3 associations discussed above, the current dissertation also provided evidence for intergenerational transmission of psychopathology from a retrospective perspective. That is, the analysis of the association between G1 lifetime psychopathology and G2 lifetime psychopathology suggested that G1-G2 transmission of psychopathology was prominent on the mothers' side, but not on the fathers' side. Specifically, both G1 maternal grandmothers' lifetime internalizing and externalizing disorders was associated with G2 mothers' internalizing disorder, and G1 maternal grandmothers' lifetime externalizing disorder predicts G2 mothers' externalizing disorders.

This intriguing finding is overall consistent with other reports in the literature on intergenerational transmission of psychopathology, but with some important new observations. With prospective research designs, many empirical studies examining the intergenerational transmission of psychopathology have reported significant relationships between parents to their offspring with regards to a range of mental health diagnoses, including PTSD (e.g., Dekel & Goldblatt, 2008; Fromm, 2012; Prager, 2003), major and minor depression (Garber & Cole, 2010; Hammen et al., 2004; Leis & Mendelson, 2010), anxiety (e.g., Eley, McAdams, et al., 2015; Murray, De Rosnay, Pearson, Bergeron, Schofield, Royal-Lawson, & Cooper, 2008;). Extending this literature, the current results suggest the intriguing possibility that there may be gender patterns the intergenerational transmission of psychopathology. That is, intergenerational transmission may be more likely to occur for females than males. However, it is important to note that the current

dissertation utilized a retrospective research design, with G1 parents' lifetime psychopathology being reported by self-interview and family interview, with also general characterization of diagnoses (i.e., internalizing and externalizing disorders). Therefore, future replication of intergenerational transmission of psychopathology with a focus on gender difference as well as differences in symptomotology are needed to draw more confirmatory conclusions.

4. Overall Summary

Taken together, the current dissertation conducted an innovative examination of the development of infants' self-regulation development in the first two years of life, in the context of family history of mental illness in the full three generation pedigree. Developing from the theoretical model (Figure 3; pg. 48 in this dissertation), the final models are presented in Figure 20 and 21.

At the grandchildren's level (G3), the current dissertation operationalized infants' self-regulation by parent reported behavioral orientation measures and demonstrated an overall increasing regulatory capacity from 3- to 24-months, with some evidence of a short-term decrease from 3- to 12-months. Taking into consideration of the developmentally appropriate presentation of regulatory capacity, the current dissertation reveals important information on infants' self-regulation development in the critical first two years of life. That is, infants present with mainly involuntary reactivity to environmental stimulus, which then fades away to transition into more voluntary control

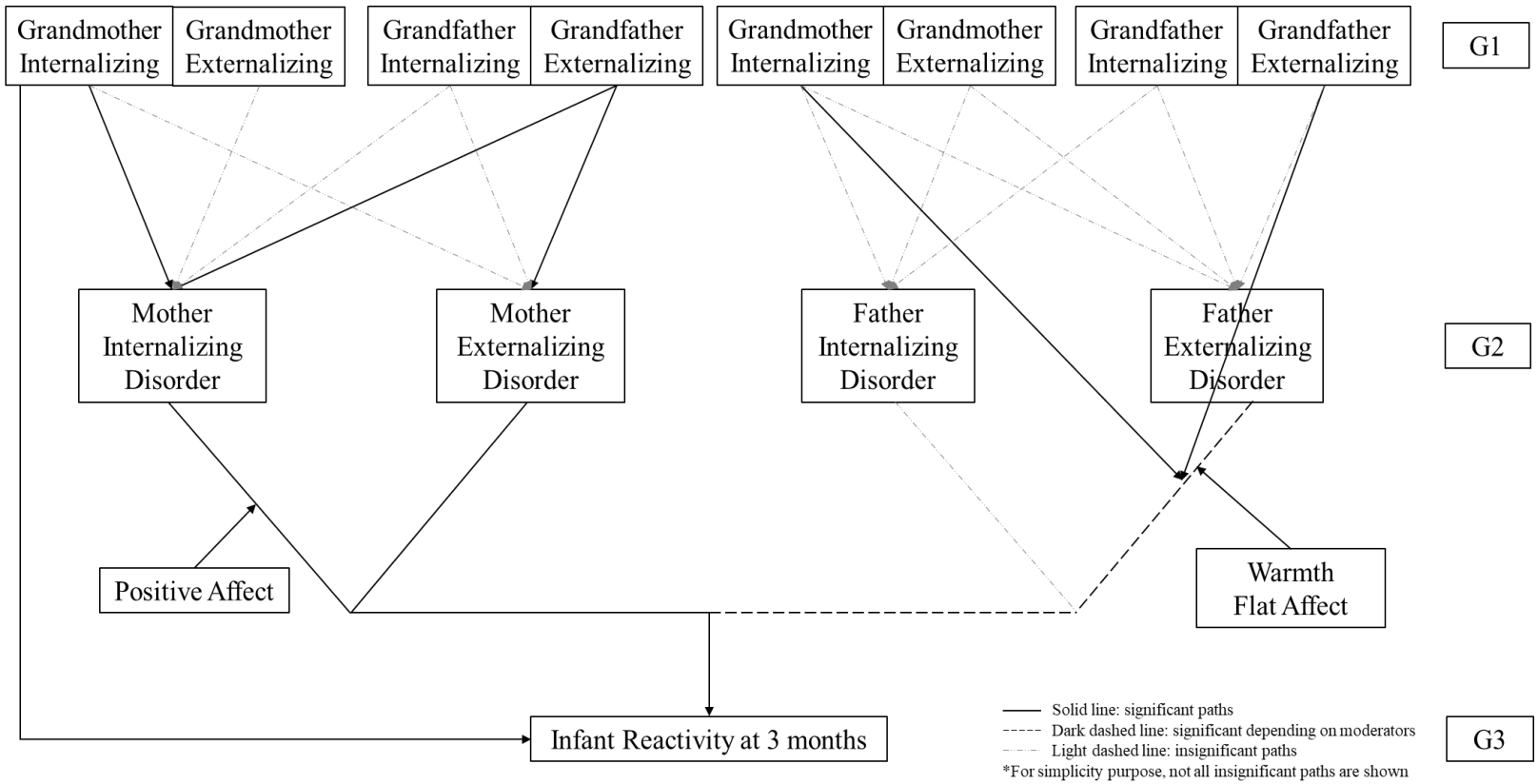

Figure 20. Overall Model for Infant Reactivity at 3 months in the Context of G1 and G2 Psychopathology

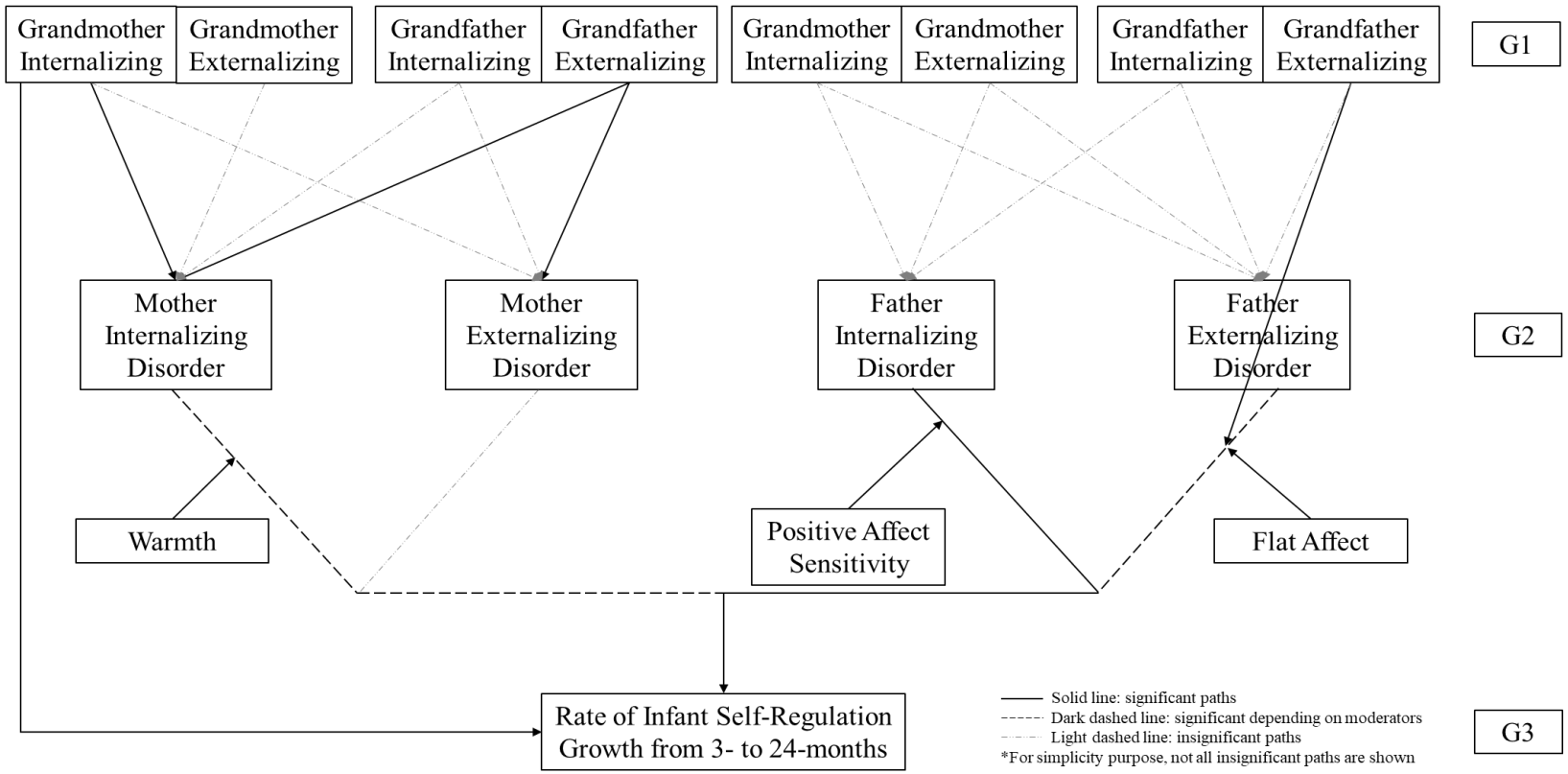

Figure 21. Overall Model for Infant Rate of Self-Regulation Growth from 3- to 24-months in the Context of G1 and G2 Psychopathology

of regulation. Consistent with the well-established theory in children's self-regulation and temperament, significant individual differences in the development of early self-regulation were revealed, suggesting the needs to examine precedents and predictors for such individual differences among infants.

Examining infants' self-regulation development in the context of their G2 parents' psychopathology, it is evident that mothers' and fathers' lifetime psychopathology is not only significantly associated with developmental patterns in their offspring's self-regulation, but also shows differential pattern of such impact. Namely, while mothers' lifetime internalizing and externalizing disorders demonstrate associative effects with infants' early involuntary control (i.e., reactivity), fathers' internalizing disorder is a better predictor for the later on development of these infants' regulatory capacity. The presence of parents' lifetime psychopathology therefore may not only directly influence children's regulatory capacity outcome, but may also influence the effectiveness (or non-effectiveness) of their interaction strategies with their infants.

Finally, the current dissertation uniquely identified the cross-generational effects of G1 (grandparental) lifetime psychopathology on G3 self-regulation outcomes. Findings suggested that history of psychopathology in G1 has lingering effects on the next two generations. Reflecting on the G2 (parental) generation, females (i.e., G2 mothers) appear more likely to be affected by both internalizing and externalizing disorders in the previous generation. Reflecting on the G3 generation, again G1 psychopathology (both internalizing and externalizing disorder) from the maternal side appears to be more strongly associated with G3 self-regulation development above and beyond the impact of G2 psychopathology. G1 psychopathology from the paternal side, on the other hand,

provides a context for how G2 fathers' psychopathology transmits its risk down to the G3 self-regulation outcomes.

5. Limitations

Some cautious must be exercised when interpreting the findings from the current dissertation. First, the statistical models, including growth mixture modeling and multivariant analysis of variance, were performed with a modest sample size of 174. In addition, the sample size decreased at later assessment points. For child self-regulation measure, the sample size decreased from 148 at 3-months to 103 at 24-months. Although the common recommended rule for structure equation modeling (SEM) is a variable to sample size ratio of 1:10 (Gefen, Straub, & Boudreau, 2000), the current dissertation utilized several approaches to minimize the negative impact of small sample size on the overall findings. For one thing, the missing data analysis indicated non-systematic missing patterns and therefore minimal differences between responders and non-responders. In addition, it has been suggested that, with LGM, increased number of measurements typically in turn increase the precision of parameters being estimated (Duncan, Bundesen, Olson, Humphreys, Chavda, & Shibuya, 1999). The current dissertation utilizes four assessment points, sufficing in providing a precise estimation of parameters.

Relatedly, the confidence of the conclusions that can be drawn from the current findings may be tempered by the possibility of Type I errors, especially given the multiple tests utilized in the analyses. However, as the current dissertation proposes innovative research questions, some of which have not been addressed in prior literature,

it was decided that setting confidence intervals on all model parameter estimated relevant to research questions at 95% level provided an appropriate balance between Type 1 and Type 2 errors. In other words, it was considered that for formative research like this there should be a stronger emphasis on hypothesis generating than strict hypotheses testing. The current results offer valuable information for future more summative research in the same area, in which tighter control over problems arising from multiplicity are more important.

Third, the main dependent variable, children's self-regulatory capacity, was measured via parent report. This method may not adequately and objectively capture the full scope of children's regulatory capacity. Although the current dissertation best accounts for this methodological limitation by taking into consideration of both mothers' and fathers' ratings on their children's regulatory capacity at each assessment point, the high-risk nature of the current sample suggest that it will be important to note that parents' ratings may be confounded by their own elevated psychopathology symptoms. Specifically, some literature has suggested that mothers with elevated depressive symptomology are more likely to be negatively biased in reporting their children's functioning (Chilcoat & Breslau, 1997; Najman, Williams, et al., 2000).

Fourth, although the current dissertation is able to establish a temporal direction between parental behaviors measured at 3-months in predicting children's self-regulation growth from 3- to 24-months, the same temporal direction cannot be established for parental behaviors and children's self-regulation intercept. To date, research on the directionality of child temperament and parenting practices has been mixed. Some researchers argue that, although parental behaviors influence child outcomes, the child's

behavior likewise influence parents as well (Forbes, Shaw, & Silk, 2008). In fact, as reviewed by Bridget and colleagues (2009), most literature examining children ages 0 to 5 indicated unidirectional effects from children's temperament on parental behaviors. In addition, when early temperamental characteristics such as reactivity are at issue, some research has shown that the effects of parental behaviors on later child regulatory outcomes may, in fact, partly be moderated by biologically driven levels of reactivity (Hendry et al., 2016). These further increase the challenges to disentangle the directionality of associations among parent dysregulation, child dysregulation, and parent-child interactions.

Finally, the context of family mental illness in the current dissertation project is represented by parents' lifetime psychopathology, indicating whether or not they have *ever* experienced internalizing or externalizing disorders when being assessed at 3-months postnatal. Although utilizing the lifetime psychopathology as a context offers valuable insights on both parents' overall levels, and especially a history, of dysregulation, the current dissertation did not differentiate the effects of parental psychopathology experienced at different stages of life. Previous results on the timing of parental psychopathology in associating with child outcomes tend to be mixed, for example, with some research identify postnatal (versus prenatal) emotion dysregulation negative predicts toddler temperament (Lin, Xu, Huang, Jia, Zhang, Yan, & Zhang, 2017), whereas some concluded the opposite (Mohler et al., 2006), and others did not indicate any differential effects of parents' current versus past symptomotology in predicting children's temperamental self-regulation (Foster, Garber, & Durlak, 2008; Weinberg & Tronick, 1998). Therefore, future research explicitly testing and clarifying

the differential timing effects of parents' psychopathology on child regulatory outcomes is needed.

6. Strengths and Implications

Despite the above-mentioned limitations, the current dissertation contributes to the existing literature on early self-regulation development and intergenerational risk transmission in several meaningful ways. First, the current dissertation is among the first to explicitly examine children's self-regulation developmental trajectory in the first two years of life using a within participants longitudinal design. Such examination of developmental trajectory significantly advances the existing literature on cross-sectional analyses on self-regulation outcomes.

Relatedly, the current dissertation is contributing significantly onto the limited literature on three-generation psychopathology research. Importantly, the current dissertation examined the lifetime psychopathology from the complete G1 and G2 pedigree. Utilizing such dataset, previous research already provided valuable information that mental disorders such as MDD have effects that persist for multiple generations and that the presence of mental disorder in any of the G1 family members poses risks for G3 developmental outcomes (Olino et al., 2008). The current results further such finding by differentiating and pinpointing the G1 psychopathology predictive effect within the G1 pedigree.

Third, the data utilized in the current dissertation was collected with multiple measurement methodologies as well as reports from multiple informants. Namely, for G3 child self-regulation measure, both mothers and fathers independently provided

behavioral observation data. G2 parents' behavioral data was objectively coded by experimenters who were blind to subjects' psychopathology history. Finally, G2 parents' and G1 grandparents' diagnostic data was reliably collected through direct interviews, phone interviews, and/or additional family member interviews. This multi-modality approach is especially recommended when collecting mental health information, as informants' self-reporting is likely to be biased by their own psychopathology symptoms and their concurrent mental status (Chilcoat & Breslau, 1997; De Los Reyes, Augenstein, Wang, Thomas, Drabick, Burgers, & Rabinowitz, 2015; Najman, Williams, et al., 2000). Therefore, taken together, this multi-modality in measurement provided a complete and non-biased data that allowed for reliable and objective conclusions.

Last but not least, the current results offer valuable implications for clinical and intervention practices. With a multi-generation design, the current results assist in the early identification of children who are at high risk for experiencing early temperamental and later self-regulation development risks. Importantly, the current dissertation aims to differentiate the influences from mothers versus fathers' psychopathology and parental behaviors. In short, these results indicate that mothers and fathers' psychopathology may play different roles in predicting the development of children's self-regulation. Further, maternal and paternal behaviors also demonstrate differential influences on child outcome in the context of their lifetime psychopathology. With such insights, targeted preventative interventions for mothers and fathers can be designed.

7. Future Directions

As reviewed above, although the current dissertation utilizes robust analytic approach that adjusts for the sample size and increases statistical power accordingly, a replication with a larger sample is needed to increase the confidence in the findings. Further, the current sample represents a high-risk sample in terms of the prevalence of lifetime psychopathology. Young children's self-regulation development in the early years may present differently for children growing up in a low-risk environment.

Consistent with the literature on theorizing rapid self-regulation development, both in the neurological and behavioral aspects, in the first two years of children's lives, the current results provided valuable information on the transition period where children's reactivity fades out and lends development to their voluntary regulation. Future developmentally appropriate and continuous measures are needed to accurately depict this transition from involuntary to voluntary control.

Finally, the current dissertation emphasized the importance of studying child developmental outcomes in the context of not only mothers' mental illness histories, but also fathers. However, as discussed above, it is not yet clear on the cumulative effects of mothers' *and* fathers' psychopathology on predicting child outcomes. Moving forward, future research would do well to draw on ecological models of child development (Bronfenbrenner, 1986) that emphasize the interaction between environmental factors from multiple aspects of a child's life – including but certain not limited to parental psychopathology. Future studies taking an integrative approach and taking into consideration of multiple aspects of risks would be valuable in informing targeted clinical prevention and intervention to promote adaptive child development.

8. Conclusion

The current dissertation examined the development of children's self-regulation in the first two years of life in the context of family history of mental illness. Results suggest that children's regulation mainly presents as involuntary reactivity in the first year, which decreases from 3- to 12-months to give way to increased voluntary regulation that rapidly increases into 24-months. Lifetime psychopathology in mothers and fathers uniquely predict such development, such that mothers' lifetime psychopathology associates with children's self-regulation intercept, whereas fathers' internalizing disorders significantly predict children's self-regulation growth rate into 24-months. Also being differentiated are mothers' versus fathers' parental behaviors in moderating the association and prediction from parental psychopathology to child self-regulation development.

These results advance the current literature on both child self-regulation development and intergenerational transmission of dysregulation. The current study explicitly focused on the development of self-regulation across the first two years of life, and aims to disentangle the effects of affective and behavioral dysregulation within the complete pedigrees from the previous two generations. These results offer valuable insights for early identification of children who are at high risk for experiencing dysregulation in affect and behaviors (and potentially subsequent psychopathology). The differential effects of maternal versus paternal psychopathology in predicting child self-regulation outcomes also provide important background for designing parent-specific and symptomotology-specific preventative interventions for mothers, fathers, and even grandparents.

APPENDIX A

INFANT BEHAVIOR QUESTIONNAIRE

As you read each description of the baby's behavior below, please indicate how often the baby did this during the LAST WEEK (the past seven days) by filling in the circle of the corresponding number. These numbers indicate how often you observed the behavior described during the *last week*.

Rating Scale:

1 = Never	5 = More than half the time
2 = Very rarely	6 = Almost always
3 = Less than half the time	7 = Always
4 = About half the time	X = Does not apply = 8

The "Does not apply" (X) column is used when you did not see the baby in the situation described during the last week. For example, if the situation mentions the baby having to wait for food or liquids and there was no time during the last week when the baby had to wait, fill in the circle corresponding to the (X) column. "Does not apply" is different from "Never" (1). "Never" is used when you saw the baby in the situation, but the baby never engaged in the behavior listed during the past week. For example, if the baby did have to wait for food or liquids at least once but never cried loudly while waiting, fill in the circle that corresponds to the (1) column. Please be sure to fill in a circle for every item.

FEEDING

When having to wait for food or liquids during the last week, how often did the baby:

1. Seem not bothered?
2. Show mild fussing?
3. Cry loudly?

During feeding, how often did the baby:

4. Lie or sit quietly?
5. Squirm or kick?
6. Wave arms?
7. Fuss or cry when s/he had enough to eat?
8. Fuss or cry when given a disliked food?

When given a new food or liquid, how often did the baby

9. Accept it immediately?
10. Reject it by spitting out, closing mouth, etc.?
11. Not accept it no matter how many times offered?

SLEEPING

Before falling asleep at night during the last week, how often did the baby:

12. Show no fussing or crying?

During sleep, how often did the baby:

13. Toss about in the crib?
14. Move from the middle to the end of the crib?
15. Sleep in one position only?

After sleeping, how often did the baby:

16. Fuss or cry immediately?
17. Play quietly in crib?
18. Coo and vocalize for periods of 5 minutes or longer?
19. Cry if someone doesn't come within a few minutes?
20. Seem angry (crying and fussing) when you left her/him in the crib?
21. Seem contented when left in the crib?
22. Cry or fuss before going to sleep for naps?

BATHING AND DRESSING

When being dressed or undressed during the last week, how often did the baby:

23. Wave his/her arms and kick?
24. Squirm and/or try to roll away?
25. Smile or laugh?

When put into the bath water, how often did the baby:

26. Startle (gasp, throw out arms; stiffen body, etc.)
27. Smile?
28. Laugh?
29. Have a surprised expression?
30. Splash or kick?
31. Turn body and/or squirm?

When face was washed, how often did the baby:

32. Smile or laugh?
33. Fuss or cry?

When hair was washed, how often did the baby:

34. Smile or laugh?
35. Fuss or cry?

How often during the last week did the baby:

36. Look at pictures in books and/or magazines for 2-5 minutes at a time?
37. Look at pictures in books and/or magazines for 5 minutes or longer at a time?
38. Stare at a mobile, crib bumper or picture for 5 minutes or longer?

39. Play with one toy or object for 5-10 minutes?
40. Play with one toy or object for 10 minutes or longer?
41. Spend time just looking at playthings?
42. Repeat the same sounds over and over again?
43. Laugh aloud in play?
44. Smile or laugh when tickled?
45. Cry or show distress when tickled?
46. Repeat the same movement with an object for 2 minutes or longer (e.g., putting a block in a cup, kicking or hitting a mobile)?

When something the baby was playing with had to be removed, how often did s/he:

47. Cry or show distress for a time?
48. Cry or show distress for several minutes or longer?
49. Seem not bothered?

When tossed around playfully, how often did the baby?

50. Smile?
51. Laugh?

During a peekaboo game, how often did the baby:

52. Smile?
53. Laugh?

DAILY ACTIVITIES

How often during the last week did the baby:

54. Cry or show distress at a loud sound (blender, vacuum cleaner, etc.)?
55. Cry or show distress at a change in parents' appearance (glasses off, shower cap on, etc.)
56. When in a position to see the television set, look at it for 2-5minutes at a time?
57. When in a position to see the television set, look at it for 5 minutes or longer?
58. Protest being put in a confining place (infant seat, playpen, car seat, etc.)?
59. Startle at a sudden change in body position (for example, when moved suddenly)?
60. Startle to a loud or sudden noise?
61. Cry after startling?

When being held, how often did the baby:

62. Squirm, pull away or kick?

When placed on his/her back, how often did the baby:

63. Fuss or protest?
64. Smile or laugh?
65. Lie quietly?
66. Wave arms and kick?
67. Squirm and/or turn body?

When the baby wanted something, how often did s/he:

68. Become upset when s/he could not get what s/he wanted?
69. Have tantrums (crying, screaming, face red, etc.) when s/he did not get what s/he wanted?

When placed in an infant seat or car seat, how often did the baby:

70. Wave arms and kick?
71. Squirm and turn body?
72. Lie or sit quietly?
73. Show distress at first; then quiet down?

When you returned from having been away and the baby was awake, how often did s/he:

74. Smile or laugh?

When introduced to a strange person, how often did the baby:

75. Cling to a parent?
76. Refuse to go to the stranger?
77. Hang back from the stranger?
78. Never "warm up" to the stranger?
79. Approach the stranger at once?
80. Smile or laugh?

When introduced to a dog or cat, how often did the baby:

81. Cry or show distress?
82. Smile or laugh?
83. Approach at once?

SOOTHING TECHNIQUES

Have you tried any of the following soothing techniques in the last two months? if so, how often did the method soothe the baby? Fill in the circle for (X) if you did not try the technique during the LAST TWO WEEKS.

84. Rocking
85. Holding
86. Singing or talking
87. Walking with the baby
88. Giving the baby a toy
89. Showing the baby something to look at
90. Patting or gently rubbing some part of the baby's body
91. Offering food or liquid
92. Offering baby his/her security object
93. Changing baby's position
94. Other (please specify) _____

APPENDIX B

TODDLER BEHAVIOR ASSESSMENT QUESTIONNAIRE

Toddler Behavior Assessment Questionnaire

 ER & SD Version

Today's date:_____

INSTRUCTIONS: **Please read carefully before starting.**

As you read each description of the child's behavior below, please indicate how often the child did this during the last month by circling one of the numbers in the left column. These numbers indicate how often you observed the behavior described during the last month.

1. Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

The "Not Applicable" column (NA) is used when you did not see the child in the situation described during the last month. For example, if the situation mentions the child going to the doctor and there was no time during the last month when the child went to the doctor, circle the (NA) column. "Do es Not Apply" (NA) is different from "Never". "Never" is used when you saw the child in the situation, but the child never engaged in the behavior mentioned during the last month. Please be sure to circle a number or NA for every item.

FIRST ARE SOME QUESTIONS CONCERNING YOUR CHILD'S BEHAVIOR WHILE PLAYING.

When playing inside the house or apartment (for example, because of bad weather) how often did your child:

1 2 3 4 5 6 7 NA (1) run through the house?

1 2 3 4 5 6 7 NA (2) climb over furniture?

When playing on a movable toy, such as a tricycle, how often did your child:

1 2 3 4 5 6 7 NA (3) attempt to go as fast as s/he could?

When s/he saw other children while in the park or playground, how often did your child:

1 2 3 4 5 6 7 NA (4) approach and immediately join in play?

1 2 3 4 5 6 7 NA (5) join in the laughing and giggling?

(1) Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

While playing alone in a sandbox or playing with dolls, how often did your child:

1 2 3 4 5 6 7 NA (6) remain interested for 30 minutes or longer?

1 2 3 4 5 6 7 NA (7) remain interested for 10 minutes or longer?

1 2 3 4 5 6 7 NA (8) remain interested for less than 10 minutes?

When you removed something your child should not have been playing with, how often did s/he:

1 2 3 4 5 6 7 NA (9) become sad?

1 2 3 4 5 6 7 NA (10) stay upset for 10 min or longer?

1 2 3 4 5 6 7 NA (11) calm down within 5 min?

1 2 3 4 5 6 7 NA (12) scream?

1 2 3 4 5 6 7 NA (13) try to grab the object back?

1 2 3 4 5 6 7 NA (14) follow your request without signs of anger?

When making a discovery (such as fitting two Lego pieces together, learning to stack blocks, or learning to turn a light switch on and off), how often did your child:

1 2 3 4 5 6 7 NA (15) smile?

1 2 3 4 5 6 7 NA (16) seem pleased?

W hen your child was asked to share her/his toys, how often did s/he:

1 2 3 4 5 6 7 NA (17) become sad?

1 2 3 4 5 6 7 NA (18) follow your instructions?

1 2 3 4 5 6 7 NA (19) protest in a whining tone of voice?

1 2 3 4 5 6 7 NA (20) follow the request without signs of anger?

While coloring by her/himself, how often did your child:

1 2 3 4 5 6 7 NA (21) continue to color alone for 20 minutes or more?

1 2 3 4 5 6 7 NA (22) continue to color alone for 10-20 minutes?

When in a shopping mall or store, how often did your child:

1 2 3 4 5 6 7 NA (23) seem eager to explore the store?

(1) Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

When a favorite toy is lost or broken, how often does your child:

1 2 3 4 5 6 7 NA (24) cry sadly?

1 2 3 4 5 6 7 NA (25) show no sign of sadness?

After s/he got a bump or scrape, how often did your child:

1 2 3 4 5 6 7 NA (26) forget about it after a couple of minutes?

1 2 3 4 5 6 7 NA (27) remain upset for a long time?

When another child took away a favorite toy that your child was playing with, how often did s/he:

1 2 3 4 5 6 7 NA (28) whimper or cry?

1 2 3 4 5 6 7 NA (29) object?

1 2 3 4 5 6 7 NA (30) find something else to play with?

1 2 3 4 5 6 7 NA (31) try to hit, kick or bite the other child?

When playing quietly with one of her/his favorite toys, how often did your child:

1 2 3 4 5 6 7 NA (32) smile?

1 2 3 4 5 6 7 NA (33) sound happy?

At the end of an exciting day, how often does your child:

1 2 3 4 5 6 7 NA (34) feel “down?”

W hen your child wanted to play outside but you said “no”, how often did s/he:

1 2 3 4 5 6 7 NA (35) com ply without protest or delay?

1 2 3 4 5 6 7 NA (36) ignore your warning?

1 2 3 4 5 6 7 NA (37) pro test by crying loudly?

1 2 3 4 5 6 7 NA (38) protest in a whining tone of voice?

1 2 3 4 5 6 7 NA (39) pout, frown, sulk, or look mad?

When looking at picture books by her/himself, how often did your child:

1 2 3 4 5 6 7 NA (40) continue to lo ok at the picture s by her /himself?

1 2 3 4 5 6 7 NA (41) lose interest or get bored quickly?

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(NA)
Never	Very Rarely	Less tha n half the time	Abo ut half the time	More than half the time	Almost always	Always	Does not apply

When your child joined in an active game with other children, (for example, one that involved running or jumping), how often did s/he:

1 2 3 4 5 6 7 NA (42) keep up with the most energetic and active children?

If plans don't work out that your child was looking forward to, how often does your child:

1 2 3 4 5 6 7 NA (43) become sad?

Following an exciting event, how often did your child:

1 2 3 4 5 6 7 NA (44) calm down quickly?

1 2 3 4 5 6 7 NA (45) remain excited for a long time?

How often did your child play alone with her/his favorite toy for:

1 2 3 4 5 6 7 NA (46) 30 minutes or longer?

1 2 3 4 5 6 7 NA (47) 10 minutes or longer?

1 2 3 4 5 6 7 NA (48) less than 10 minutes?

If you or someone else in your family is tickling, wrestling, or playfully chasing your child, how often did he/she:

1 2 3 4 5 6 7 NA (49) smile?

1 2 3 4 5 6 7 NA (50) laugh?

1 2 3 4 5 6 7 NA (51) ask for more?

When unable to do some task, how often does your child:

1 2 3 4 5 6 7 NA (52) feel depressed?

When you told your child that s/he would have to play alone for a short time, how often did:

1 2 3 4 5 6 7 NA (53) s/he require constant encouragement to continue playing alone?

1 2 3 4 5 6 7 NA (54) just one activity or object keep her/him busy?

When upset, how often did your child:

1 2 3 4 5 6 7 NA (55) change to fee ling better within a few minutes?

(1) Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

How often during the past month did your child:

1 2 3 4 5 6 7 NA (56) play games which involved running around, banging, or dumping out toys

1 2 3 4 5 6 7 NA (57) play quiet games that did not involve moving, such as looking at books or arranging toys

When unable to do some task, how often does your child:

1 2 3 4 5 6 7 NA (58) feel depressed?

When near something s/he had been told was dangerous, how often did the child:

1 2 3 4 5 6 7 NA (59) approach slowly and cautiously?

1 2 3 4 5 6 7 NA (60) touch or play with the object?

1 2 3 4 5 6 7 NA (61) stay away from the dangerous object?

When tired, how often does your child:

1 2 3 4 5 6 7 NA (62) become tearful?

While playing with a detailed or complicated toy (such as a big doll house or toy garage), how often did your child:

1 2 3 4 5 6 7 NA (63) exp lore the toy thoroughly?

1 2 3 4 5 6 7 NA (64) become easily bore d or restless?

1 2 3 4 5 6 7 NA (65) only give the toy a quick try?

NOW, PLEASE ANSWER SOME QUESTIONS ABOUT EATING, DRESSING, BATHING, AND GOING TO BED.

When your child was given something to eat or drink that s/he did not like, how often did s/he:

1 2 3 4 5 6 7 NA (66) cry?

1 2 3 4 5 6 7 NA (67) accept the food or drink without sign of anger or protest?

1 2 3 4 5 6 7 NA (68) push the plate away?

(1) Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

When your child wanted to eat something sweet before dinner was finished but did not get it, how often did s/he:

1 2 3 4 5 6 7 NA (69) pro test by crying loudly?

1 2 3 4 5 6 7 NA (70) refuse to eat the rest of dinner?

When in the bathtub, how often did your child:

1 2 3 4 5 6 7 NA (71) laugh?

1 2 3 4 5 6 7 NA (72) babble or talk happily?

1 2 3 4 5 6 7 NA (73) sit quietly?

1 2 3 4 5 6 7 NA (74) splash or kick?

1 2 3 4 5 6 7 NA (75) play with toys with a lot of energy? (If t has toys in the bath, mark "NA"

When being dressed or undressed, how often did your child:

1 2 3 4 5 6 7 NA (76) squirm or try to get away?

1 2 3 4 5 6 7 NA (77) lie or sit quietly long enough for you to get her/him ready?

When your child was having her/his hair brushed or face washed, how often did s/he:

1 2 3 4 5 6 7 NA (78) try to play with you?

When being gently rocked or hugged, how often did your child:

1 2 3 4 5 6 7 NA (79) smile?

1 2 3 4 5 6 7 NA (80) giggle?

When it was time for bed or a nap and your child did not want to go, how often did s/he:

1 2 3 4 5 6 7 NA (81) settle down quickly?

1 2 3 4 5 6 7 NA (82) have difficulty settling down?

1 2 3 4 5 6 7 NA (83) stay awake for a long time?

1 2 3 4 5 6 7 NA (84) fall asleep within 10 minutes?

1 2 3 4 5 6 7 NA (85) whimper or sob?

1 2 3 4 5 6 7 NA (86) pro test by crying loudly?

1 2 3 4 5 6 7 NA (87) physically resist or struggle?

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(NA)
Never	Very Rarely	Less tha n half the time	Abo ut half the time	More than half the time	Almost always	Always	Does not apply

NEXT ARE SOME QUESTIONS ABOUT MANY D IFFERENT ASPECTS OF YOUR CHILD'S BEHAVIOR.

When your child was involved in a game or activity by her/himself and you interrupted the game because it was mealtime or time for an outing, how often did your child:

1 2 3 4 5 6 7 NA (88) easily move on to what you needed him/her to do?

When you disapprove of your child's behavior, how often does your child:

1 2 3 4 5 6 7 NA (89) have hurt feelings?

1 2 3 4 5 6 7 NA (90) seem unaffected by your disapproval?

When given a wrapped package or a new toy in a bag, how often did your child:

1 2 3 4 5 6 7 NA (91) remain neutral (for example, not smile)?

1 2 3 4 5 6 7 NA (92) squeal with joy?

1 2 3 4 5 6 7 NA (93) laugh?

When asked to wait for something (like dinner), how often did your child:

1 2 3 4 5 6 7 NA (94) become upset?

1 2 3 4 5 6 7 NA (95) wait patiently?

1 2 3 4 5 6 7 NA (96) find something to distract themselves until it was time?

While reading a story of average length to your child, how often did s/he:

1 2 3 4 5 6 7 NA (97) pay attention to your reading during the entire story?

1 2 3 4 5 6 7 NA (98) become restless or bored after the first few pages or minutes?

When told to do something s/he does not want to do, how often does your child:

1 2 3 4 5 6 7 NA (99) become tearful?

When at the doctor's office or a clinic how often did your child:

1 2 3 4 5 6 7 NA (100) cling or hold on to you and not want to let go?

1 2 3 4 5 6 7 NA (101) seem unconcerned and comfortable?

1 2 3 4 5 6 7 NA (102) cry or struggle when the doctor tried to touch her/him?

(1) Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

When the child needed to sit still, as in church, a waiting room, or a restaurant, how often did s/he:

1 2 3 4 5 6 7 NA (103) try to climb out of the chair?

1 2 3 4 5 6 7 NA (104) play quietly?

1 2 3 4 5 6 7 NA (105) try to climb all over other c hairs?

1 2 3 4 5 6 7 NA (106) remain still and calm even though other children started to giggle or laugh

When s/he hears a sad story, how often does your child:

1 2 3 4 5 6 7 NA (107) whimper or sob?

If a stranger came to your home or your apartment, how often did your child:

1 2 3 4 5 6 7 NA (108) allow her/himself to be picked up without protest?

1 2 3 4 5 6 7 NA (109) abandon or walk away from you and go to the stranger?

1 2 3 4 5 6 7 NA (110) "warm up" to the stranger within 10 minutes?

When you are comforting your upset child, how often does s/he:

1 2 3 4 5 6 7 NA (111) cheer up within 5 minutes?

1 2 3 4 5 6 7 NA (112) calm down quickly?

1 2 3 4 5 6 7 NA (113) rarely cry for more than a coup le of minutes?

While watching a favorite children's television program such as Sesame Street, how often did your child:

1 2 3 4 5 6 7 NA (114) pay attention to the whole show?

1 2 3 4 5 6 7 NA (115) watch only the first few minutes of the show before showing signs of restlessness?

When watching a sad event in a TV show, how often does your child:

1 2 3 4 5 6 7 NA (116) become upset?

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Never	Very Rarely	Less tha n half the time	Abo ut half the time	More than half the time	Almost always	Always

When placed in a car seat or stroller, how often did your child:

1 2 3 4 5 6 7 NA (117) kick?

1 2 3 4 5 6 7 NA (118) squirm?

1 2 3 4 5 6 7 NA (119) sit still?

In a restaurant chair or grocery store cart or other similar situations, ho w often did your child:

1 2 3 4 5 6 7 NA (120) have trouble sitting still?

1 2 3 4 5 6 7 NA (121) sit patiently and quietly?

When the child knew the parents were about to leave her/him at home, how often did your child:

1 2 3 4 5 6 7 NA (122) cry?

1 2 3 4 5 6 7 NA (123) cling to parent?

1 2 3 4 5 6 7 NA (124) show no sign of being upset?

For no apparent reason, how often does your child:

1 2 3 4 5 6 7 NA (125) appear sad or blue?

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(NA)
Never	Very Rarely	Less tha n half the time	Abo ut half the time	More than half the time	Almost always	Always	Does not apply

When one of the parents' friends who does not have daily contact with your child visited the home, how often did your child:

1 2 3 4 5 6 7 NA (126) look at you to see if it was o kay?

1 2 3 4 5 6 7 NA (127) talk much less than usual?

1 2 3 4 5 6 7 NA (128) enthusiastically greet them?

1 2 3 4 5 6 7 NA (129) squeal with jo y?

1 2 3 4 5 6 7 NA (130) smile?

1 2 3 4 5 6 7 NA (131) babble or talk happily?

While shopping, if you did not agree to buy your child a toy that s/he wanted, how often did s/he:

1 2 3 4 5 6 7 NA (132) protest in a whining tone of voice?

1 2 3 4 5 6 7 NA (133) physically struggle when you tried to separate her/him from the toy?

When you were going out and your child did not want to stay with the regular sitter, how often did s/he:

1 2 3 4 5 6 7 NA (134) pout or frown?

1 2 3 4 5 6 7 NA (135) show no signs of anger?

When asked not to play with something, how often did your child:

1 2 3 4 5 6 7 NA (136) play with it anyway?

1 2 3 4 5 6 7 NA (137) follow your request?

How often did interesting outdoor sights (such as water sprinklers, birds, or traffic) hold your child's attention for:

1 2 3 4 5 6 7 NA (138) 5 minutes or longer?

1 2 3 4 5 6 7 NA (139) less than 5 minutes?

When you are comforting your upset child, how often does s/he:

1 2 3 4 5 6 7 NA (140) cheer up within 5 minutes?

1 2 3 4 5 6 7 NA (141) calm down quickly?

1 2 3 4 5 6 7 NA (142) rarely cry for more than a coup le of minutes?

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(NA)
Never	Very Rarely	Less tha n half the time	Abo ut half the time	More than half the time	Almost always	Always	Does not apply

When you did not allow your child to do something for her/himself (for example, dressing, or getting into the car seat), how often did your child:

1 2 3 4 5 6 7 NA (143) show signs of anger because s/he wanted to do it her/himself?

1 2 3 4 5 6 7 NA (144) try to p sh you a way?

If you were not able to give immediate attention to your child because you were busy (for example, you were cooking dinner or talking on the phone) how often did your child:

1 2 3 4 5 6 7 NA (145) cry loudly?

1 2 3 4 5 6 7 NA (146) find something else to do until you were free?

W hile a story was being read to your child, how often did s/he:

1 2 3 4 5 6 7 NA (147) sit quietly?

1 2 3 4 5 6 7 NA (148) get restless?

When first visiting a babysitting co-op, daycare center, or church nursery, how often did your child:

1 2 3 4 5 6 7 NA (149) cry when not being held by the parent and resist being put down?

1 2 3 4 5 6 7 NA (150) feel at ease within 10 minutes?

1 2 3 4 5 6 7 NA (151) immediately begin to explore?

When your child was approached by a stranger when you an d she /he were out (for example, shopping) ho w often did your child:

1 2 3 4 5 6 7 NA (152) babble or talk?

1 2 3 4 5 6 7 NA (153) show distress or cry?

1 2 3 4 5 6 7 NA (154) avoid possible danger by looking to parent for assurance?

When you turned off the television set (because it was bedtime, dinnertime, or time to leave), how often did your child:

1 2 3 4 5 6 7 NA (155) throw a tantrum or get really mad?

(1) Never	(2) Very Rarely	(3) Less tha n half the time	(4) Abo ut half the time	(5) More than half the time	(6) Almost always	(7) Always	(NA) Does not apply

When it was time to leave a friend's house and your child did not want to go, how often did s/he:

1 2 3 4 5 6 7 NA (156) follow you without signs of anger?

When you are comforting your upset child, how often does s/he:

1 2 3 4 5 6 7 NA (157) cheer up within 5 minutes?

1 2 3 4 5 6 7 NA (158) calm down quickly?

1 2 3 4 5 6 7 NA (159) rarely cry for more than a coup le of minutes?

When your child was playing alone and a friend or relative (not in the immediate family) came into the room, how often did s/he:

1 2 3 4 5 6 7 NA (160) at first pay no attention to the visitor and continue playing?

When asked to do so, how often did your child:

1 2 3 4 5 6 7 NA (161) lower his/her voice?

1 2 3 4 5 6 7 NA (162) clean up his/her toys?

1 2 3 4 5 6 7 NA (163) have difficulty following instructions?

When you or another person were visibly upset, how often did your child:

1 2 3 4 5 6 7 NA (164) smile or laugh?

APPENDIX C

GLOBAL RATINGS FOR INFANT-PARENT PLAY DEFINITIONS AND RATING GUIDELINES

TO BE RATED FOR UNSTRUCTURED TIME DURING VISIT TO ORI

I. INFANT

A. Position of Infant during majority of interaction.

1. Not held by parent
2. Held by parent
3. Held about half the time.

C. Baby's Responsiveness to Parent (Smiling, reaching, obvious looking). Baby need not have gaze directed toward mother if its behavior is clearly in response to the mother's behavior.

1. Very Low. Ignores parent. May avoid by turning away.
2. Low. Occasional or low intensity responsiveness. May respond with neutral affect.
3. Moderate. Usually responds socially to parent's interactive stimulation.
4. High. Consistently responds with low intensity behaviors or frequently responds with vigorous behavior.
5. Very High. Baby consistently responds with vigorous, social interactive behavior (smiling, vocalizing, reaching, etc.).

D. Infant Disengagement.

This scale measures the degree of Baby's disconnectedness from parent as expressed by gaze (i.e. gaze away from parent's face), body orientation, or responsiveness. **Gaze:** Baby's involvement in play with parent is only sporadic and does not involve turn-taking. **Body orientation:** Baby's body position may be partially averted, rigid, or slumping (baby is positioned so that baby cannot see parent's face most of the time). **Lack of responsiveness:** Baby rarely if ever responds to parent's initiations; parent controls play without the involvement of baby or no reciprocal play occurs; generally reflects withdrawal or avoidance by baby.

1. Very Little. Little or no disengagement as defined above.
2. Little. Up to one third of the interaction.
3. Some. Up to half of the interaction.
4. Much. Up to two thirds of the interaction.
5. Very much. Consistently disengaged. More than two thirds of the interaction

E. Infant Positive Affect

This scale measures the frequency and degree to which the infant expresses positive affect toward the parent as indicated by facial expression (slight smiling to broad smile or play face) and/or vocal expression (talk, babble, coo, and laugh). Gaze need not be directed toward the parent as long as affect appears to be in response to parental behavior.

1. Very Little. Baby's behavior is consistently neutral or negative; no instances of positive expression; baby is not at all positively excited.
2. Little. Baby's behavior most often fails to convey positive affect; very few and brief instances of positive affect.
3. Some. Baby's behavior occasionally conveys positive affect; baby becomes somewhat or briefly excited.
4. Much. Baby's behavior frequently conveys positive affect; baby becomes excited.
5. Very Much. Baby's behavior consistently and frequently conveys positive affect; baby's affect is best characterized as positive affect or play; baby may be very excited; a high level of excitement occurs more than once or is sustained.

F. Infant Distress

This scale measures the frequency and intensity of infant distress displays as expressed by facial expression (wary, pout, grimace, frown, sad, negative) vocalizations (fuss/cry, whine), or other infant stress behavior (hiccups, spitting up, loss of postural control, jitteriness or jerky body movements).

1. Very Little. Little or no distress as defined above.
2. Little. Rare, brief, or low intensity displays of distress as defined above (wary, frown, sad expression; hiccups, spitting, loss of postural control).
3. Some. Occasional displays of distress; may be of moderate intensity (fuss, whine, brief cry).
4. Much. Frequent, prolonged, or intense displays of distress (cry, squirm, grimace, etc.).
5. Very Much. Sustained and intense displays of distress. Interaction may have been shortened due to fussing (cry, squirm, grimace, etc.).

G. Range of Affect

This scale reflects the range of infant affect as reflected by the range of infant states occurring during the interaction.

1. Minimal. Little variability of affect is evident. Infant displays only one or two distinct affect states (Fuss & sober, sober & neutral, neutral & interest, interest & smile/play).
2. Moderate. Infant displays three to four affective expressions (e.g. fuss, sober, neutral; neutral, interest, simple smile).
3. Wide. Infant displays the full range of affective expressions (five or more).

H. Infant Activity

This scale reflects the amount of gross motor activity displayed by the infant during the interaction.

1. Very Little. Calm. Quiet, little or no gross motor activity.
2. Little.
3. Average. Moderate level of activity; no periods of high or intense motor activity occur.
4. High.
5. Very High. Vigorous or high levels of motor activity occur frequently during the interaction.

II. PARENTS

A. Amount of Caretaking Responsibility of this Parent. This refers to the relative amount of time spent doing things like feeding, changing, holding, soothing, etc., compared to the other parent if both are present.

1. Not at all or not enough to score other items. Stop here.
2. Less than half
3. About half
4. Most, more than half.
5. All or almost all. Score here if other parent was not present.

B. Parent's Quality of Physical Contact.

1. Highly Inappropriate. Parent seems rigid, unaccommodating, abrupt, rough or inappropriate. Often seen with poking or pinching baby's face.
2. Inappropriate. Parent handles baby in an impersonal way, showing little warmth or desire for closeness. Some insensitivity, but not extreme.
3. Inconsistent. Parent handles baby in a warm way in some situations, but in others she tends to be unaccommodating, distant, or insensitive. May not always shift baby's position in response to his/her clues.
4. Appropriate. Parent usually seeks warm, close, physical contact with baby, is generally sensitive when handling baby.
5. Highly Appropriate. Parent characteristically seeks warm, close, physical contact with baby, and is extremely sensitive and tender during physical contact.
0. NA. No physical contact occurred.

C. Expression of Positive Regard by Parent (i.e., Positive Affect or content of verbalizations).

1. Very Low. No instances observed.
2. Low. Infrequent and weak signals of positive affect are shown.
3. Moderate. Parent displays some positive regard.
4. High. Parent frequently displays positive regard in the course of their time together.
5. Very High. Parent consistently displays positive regard in the course of their time together.

D. Expression of Negative Regard by Parent.

1. Very Low. No instances of negative feelings such as anger, frustration, impatience, disgust, or general dislike are observed in face or voice.
2. Low. Few instances.
3. Moderate. Parent occasionally expresses such feelings briefly or with low intensity.
4. High. Frequent.
5. Very High. Feelings of negative regard are expressed often or with high intensity.

E. Sensitivity

Sensitivity reflects the parent's ability to perceive and accurately interpret the infant's signals and to respond to them appropriately and promptly. Sensitivity requires not only that the parent be accessible to the infant, rather than disengaged, but that s/he be alert to subtle aspects of the infant's signals. Sensitive responses are well-timed, reflect empathy with the infant's state and affect. Sensitive behavior is reflected in behavior that will facilitate positive, smooth, and synchronous interactions.

1. Very Insensitive. Parent always or almost always fails to respond appropriately and promptly, though occasionally may show the capacity for sensitivity, especially when the infant's affect and activity are not too discrepant with her/his own or when the infant displays great distress. An otherwise appropriate response may be delayed to the point that it is no longer contingent upon the infant's behavior or is discontinued prematurely. The parent's behavior may appear perfunctory, half-hearted, or impatient.
2. Insensitive.
3. Inconsistent. Parent can be very sensitive on occasion but there are periods when s/he is insensitive. Parent is more often sensitive than insensitive.
4. Sensitive.
5. Very Sensitive. Parent always or almost always responds to the infant promptly and appropriately. She/he is never seriously out of tune with the infant's state, affect, tempo, or signals.

F. Warmth

This scale reflects the quality of parent's affection toward baby; it includes the extent to which the parent expresses affection toward baby in a pleasurable way. Warmth may be apparent in vocal affect or content, expression, or handling.

1. None. Parent's behavior consistently fails to convey warmth; interactions generally lack tenderness, caring and affection.
2. Little.
3. Some. Parent's behavior usually expresses some warmth, but on some or many occasions her/his behavior lacks tenderness, caring, affection.
4. Much.
5. Very Much. Parent's behavior always expresses warmth. Her/his behavior is very tender, caring and affectionate.

G. Flatness of Affect of Parent

This scale measures the frequency and the degree to which flatness of affect (i.e., neither warmth nor hostility) is expressed by facial expression (blank, impassive, expressionless), gaze (looking away from baby or toys, looking at TV or at nothing), vocal expression (flat tone or rarely speaking when engaged with baby), and affect (conspicuously lacking, including hostility).

1. Never flat. Affect is always either affectionate or hostile.
2. Rarely flat
3. Occasionally flat. Periods of affection or hostility alternate with periods of flatness; affection or hostility frequently displayed, but along with some muted or subdued affect.
4. Flat.
5. Consistently flat. Neither affection nor hostility is ever displayed.

H. Disengagement

This scale measures the degree of parent's disconnectedness from baby as expressed by pacing (i.e., long, empty pauses between instances of stimulation), body orientation, or initiative. **Pacing**: parent's involvement in play with baby is only sporadic and does not involve turn-taking; parent is slow in responding to baby. **Body orientation**: parents's body position may be partially averted or rigid: e.g., parent sits so she can't see baby's face most of the time; parent sits awkwardly or as though ready to leave; positions baby awkwardly; Parent keeps distance from baby even when baby expresses desire for closeness. **Lack of initiative**: 1) Parent initiates almost no activities; 2) Parent leaves baby doing nothing during much of the interaction; 3) Baby controls the play without the

involvement of parent or no play occurs at all; 4) Parent does not respond to baby's initiation in a way that furthers the interaction; and 5) choice of activity (parent offers stimulation far below baby's developmental or interest level. This may also reflect hesitancy and withdrawal during the interaction. The scale reflects Undercontrolling behavior (Tronick, Ricks, & Cohn, 1982).

1. Very Little.
2. Little
3. Some.
4. Much
5. Very Much

I. Discrepant Communication

This scale measures the degree to which the parent's communications to baby express ambivalence, with seeming engagement belied by subtle signs, as shown by discrepancy between aspects of the parent's behavior. For instance, s/he initiates interaction but then does not respond when baby does; she/he may initiate interaction while conveying disinterest. Other examples include: sweet voice and insistent hands, pleasant voice and hostile content, sharp voice matched with disarming smile, gentle insistence combined with brief indications of disgust when baby does not comply; seemingly affectionate behavior that is irritating to baby and is more like jabbing, poking, or pinching (not including nose-cleaning), and produces a startle, wince, or withdrawal.

1. Very Little.
2. Little
3. Some.
4. Much
5. Very Much

J. Interfering Manipulation

This scale does not refer to appropriate limit-setting or structuring, but measures the degree to which the parent's behavior interferes with rather than facilitates baby's goals, as shown by 1) body control: parent manipulates baby's body, arms, legs to accomplish something parent wants; 2) pacing: (non-contingent pacing) parent is involved and active but her/his pacing is not contingent on baby's rhythm or cues; pacing is often, but not always fast or intense; 3) control of interaction: parent controls the choice and duration of the activity in spite of clear signals that the activity is not liked by baby, has been continued too long, or is too difficult. Parent interferes with baby's play to change or correct an activity or to limit baby's range of activity. Parent keeps an interesting object just out of reach or takes away an object of baby's interest; teasing; parent makes baby wait and watch while parent performs an activity--this does not refer to a brief

demonstration, but to instances in which baby wants involvement but parent ignores or prevents.

1. Very Little.
2. Little
3. Some.
4. Much
5. Very Much

K. Flexibility of Behavior

This scale measures the degree to which the parent is able to engage in the appropriate range, variability, and flexibility of behavior and activities necessary to maximize the infant's engagement and affective responsiveness. The parent should be judged based on the variety of behaviors and modes of interaction, and ability to modulate appropriately the pace and intensity of the interaction. Although the parent may not necessarily be successful at engaging the infant, a variety of strategies should be evident. Frequently evident with poverty of parental verbalizations.

1. Very Low. Under or over stimulation of the infant. Parent seems generally unable to modulate the intensity of stimulation to play effectively. Play may also appear stereotypic or a limited repertoire of behavior is evident.
2. Low.
3. Moderate. Some variability is evident in play but the parent may on occasion appear inflexible and ineffectual.
4. High.
5. Very High. Behavior is varied as necessary. Parent uses several strategies and at least three modes of stimulation during the interaction (facial expression, vocal affect, physical contact)

L. Intrusiveness

This scale measures the degree to which the parent's behavior appears to be intrusive and/or irritating to the baby. The behavior generally produces a startle, wince, withdrawal, grimace, or fuss from the baby. Some examples are jabbing, poking, pinching, or prolonged close proximity to the baby's face; is generally annoying to the baby; parent suddenly and unexpectedly moves objects or their face in close to baby's face, producing a startle, wince or withdrawal--unlike the "Boo!" in the common game "Ah, Boo!" This behavior is not part of a rhythmic game format. This may also include instances when the parent is persistently attempting to engage the infant when the infant is looking away.

1. Very Little. Few or no instances of intrusiveness as defined above.
2. Little.

3. Some. Several instances of intrusive behavior, or a few prolonged (more than five seconds duration) or repetitious instances
4. High.
5. Very High. Several instances of intrusive behavior. The parent's behavior is best characterized as intrusive.

M. Your confidence in the above ratings.

1. Very Low
2. Low
3. Moderate
4. High
5. Very High

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